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User's Manual for the Plume Visibility Model (PLUVUE)

Systems Applications, Inc.
San Rafael, CA

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16. ABSTRACT

The plume visibility model (PLUVUE) is designed to predict the impacts of a single emissions source on visibility in Federal Class I areas. The objective of the model is to calculate visual range reduction and atmospheric discoloration caused by plumes consisting of primary particulates, nitrogen oxides and sulfur oxides. The model uses the Gaussian equation for transport and dispersion. The spectral radiance is calculated for views with and without the plume to calculate other parameters related to perceptibility and contrast reduction. Plume optics calculations are made for two modes, plume-based and observer-based. Four types of calculations can be performed at each downwind distance: effects for horizontal lines of sight with a clear sky background; effects of the plume on horizontal views with white, grey or black viewing object; views looking down the plume centerline toward the source.

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by

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This report is issued by the Environmental Protection Agency to report technical data of interest to a limited number of readers. Copies are available - in limited quantities - from the Library Services Office (MD-35), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711; or, for a fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

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Preface

This publication contains information on and the computer programs for the Plume Visibility Model (PLUVUE) which is based on Gaussian dispersion assumptions, state-of-the-art chemical and physical reactions and transformations of precursors in the atmosphere, light scattering and absorption characteristics of the resultant aerosol and radiative transfer through the aerosol along different lines of sight. The model is applicable to assessing visibility impairment due to pollutants emitted from well-defined point sources. The Plume Visibility Model (PLUVUE) is one of the atmospheric dispersion models on the User's Network for Applied Modeling of Air Pollution (UNAMAP) system. The UNAMAP system may be purchased on magnetic tape from NTIS for use on a user's computer system. For information on UNAMAP contact: Chief, Environmental Operations Branch, Meteorology and Assessment Division, (MD-80), U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

Although attempts are made to thoroughly check out computer programs with a wide variety of input data, errors are found occasionally. In case there is a need to correct, revise or update this model, revisions will be distributed in the same manner as this report. Revisions may be obtained as they are issued by completing the mailing form on page V. A user can be assured that the latest version of the Plume Visibility Model (PLUVUE) is on the UNAMAP system.

Comments and suggestions regarding this publication should be directed to: Chief, Source Receptor Analysis Branch, Monitoring and Data Analysis Division (MD-14), EPA, Research Triangle Park, NC 27711. However, technical questions regarding execution of the model may be handled by telephone call to the Chief, Modeling Support Section, Source Receptor Analysis Branch in Durham, NC at 919-541-5335 or, using FTS, 629-5335.

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1 INTRODUCTION

With the Clean Air Act Amendments of 1977, Congress declared as a national goal the protection and restoration of visibility in national parks and wilderness areas that have been designated as class I areas. The implementation of a regulatory program designed to achieve this goal requires both a modeling capability, with which the visual impact of emissions from new or existing sources can be predicted, and a measurement capability to measure existing impacts and to monitor progress toward the national goal.

The purpose of this document is to provide documentation of a plume visibility model, PLUVUE, which was designed to predict the impacts of a single emissions source on visibility in class I areas. This model is a refinement of the plume model developed by Systems Applications, Incorporated (SAI) for the U.S. Environmental Protection Agency (EPA) in 1978. Refinements of the 1978 model are described in this volume; however, the reader should refer to an earlier report (Latimer et al., 1978) for additional details on the model and to the EPA's report to Congress on visibility (EPA, 1979).

In addition, this user's manual and the visibility model should be used in conjunction with the other technical guidance documents in this series. In particular, the document entitled, "Workbook for Estimating Visibility Impairment," EPA-450/4-80-031, should be consulted before the plume visibility model is applied.

1.1 OVERVIEW OF THE MODEL

The design objective of the model is to calculate visual range reduction and atmospheric discoloration caused by plumes consisting of primary particulates, nitrogen oxides, and sulfur oxides emitted by a single emissions source. Primary emissions of sulfur dioxide (SO_2) and nitric oxide (NO) do not scatter or absorb light and therefore do not cause visibility impairment. However, these emissions are converted in the atmosphere to secondary species that do scatter or absorb light and have the potential to cause visibility impairment. SO_2 emissions are converted to sulfate ($SO_4^=$) aerosol, such as sulfuric acid, ammonium sulfate, and acid ammonium sulfates. These aerosols are generally formed or grow to a size (0.1 to 1.0 μm) that is effective in scattering light. Nitric oxide (NO) emissions are converted to nitrogen dioxide (NO_2) gas, which is effective in absorbing light. In turn, NO_2 is converted to nitric acid vapor (HNO_3), which neither absorbs nor scatters light. In some situations, nitric acid may form ammonium nitrate or organic nitrate aerosol, which scatters light. However, in many nonurban plumes nitrate probably remains as HNO_3 vapor without visual effects. Eventually, all primary particulates, secondary aerosol, and gases in a plume are removed from the atmosphere as a result of surface deposition and precipitation scavenging. PLUVUE is designed to predict the transport, atmospheric diffusion, chemical conversion, optical effects, and surface deposition of point-source emissions.

The model uses a Gaussian formulation for transport and dispersion. The spectral radiance $I(\lambda)$ (i.e., the intensity of light) at 39 visible wavelengths ($0.36 < \lambda < 0.75$ μm) is calculated for views with and without the plume; the changes in the spectrum are used to calculate various parameters that predict the perceptibility of the plume and contrast reduction caused by the plume (see Latimer et al., 1978). The four key perception parameters for predicting visual impact are:

- Reduction in visual range.
- Contrast of the plume against a viewing background at the 0.55 μm wavelength.
- The blue-red ratio (color shift) of the plume.
- The color change perception parameter $\Delta E(L^*a^*b^*)$.

PLUVUE is designed to perform plume optics calculations in two modes. In the plume-based mode, the visual effects are calculated for a variety of lines of sight and observer locations relative to the plume parcel; in the observer-based mode, the observer position is fixed and visual effects are calculated for the specific geometry defined by the positions of the observer, plume, and sun. For either mode, the model requires the user to select up to 16 different distances downwind of the emissions source. These distances determine the locations of the optics calculations along the plume trajectory.

For the plume-based calculations, the distance downwind of the emissions source is the main reference. At each distance, calculations are done for a range of:

- Scattering angles (Θ).
- Azimuthal angles (α) between the line of sight and the plume centerline.
- Elevation angles (β) of the line of sight.
- Distances from the observer to the plume centerline (r_p) and from the observer to the background viewing object (terrain) behind the plume (r_o).

For the observer-based calculations, both the observer position and the direction of the plume trajectory are fixed by user-supplied specifications appropriate to the given application:

- Wind direction
- Location of the source

> Location of the observer

> Date and time.

These specifications allow the specific plume-observer geometry (θ, α, β, r_p) to be calculated for each downwind distance on the plume trajectory. Calculations are performed for lines of sight emanating from the observer's location and through the plume center at various downwind distances. Each line of sight is matched with its particular set of these specifications.

For either plume-based or observer-based calculations, there are four types of calculations that can be performed at each downwind distance. The first calculates the effects for horizontal lines of sight with a clear sky background. Plume-based calculations include a range of scattering angles (θ), azimuthal angles between the line of sight and the plume centerline (α), and observer-to-plume distances (r_p). The observer-based computation uses the specific values of these variables for each downwind point appropriate for the given plume-observer geometry.

The second type of calculation is for nonhorizontal views of the plume with a clear sky background. The plume-based calculations include a range of different elevation angles (β) for the line of sight in addition to the three parameters varied in the horizontal view calculations. The observer-based calculations are done only once for the specific angles and distances of each point of analysis along the plume trajectory.

The third type of calculation evaluates the effect of the plume on horizontal views with white, gray, and black viewing object (terrain) backgrounds with uniform spectral reflectances of 1.0, 0.3, and 0.0, respectively. The plume-based calculations are done for the range of scattering angles (θ), observer-to-plume distances (r_p) and observer-to-background object distances (r_o) assuming the line of sight is perpendicular to the plume centerline ($\alpha = 90°$). However, in the observer-based calculations, the values of the angles and distances for the specific geometry are used.

The fourth type of calculation is for views looking down the centerline of the plume toward the source. The plume-based calculations consider the range of plume segment lengths (Δx) along the plume. These segments are determined by the analysis points (up to 16) used to specify the plume trajectory. The calculations are also done for a range of distances from the observer to the plume (r_p) for each different plume segment. The observer-based calculations are much simpler for this case because all the distances and angles are specified. The observer-based calculations assume that the azimuthal angle between the observer's line of sight and the plume centerline is small but not zero. The observer based calculations are done for white, gray, and black object (terrain) viewing backgrounds, as well as for the sky viewing background.

1.2 LIMITATIONS OF THE MODEL

An effort is currently underway to compare PLUVUE model calculations with field measurements near one emissions source in the Southwest. The results of this study are not yet available, so it is difficult to assess the accuracy and limitations of the model, even for this one application. However, it is clear that there are significant uncertainties in the model, primarily because it is based on the approximate Gaussian formulation. A shibboleth is that plume dispersion models are accurate only within a factor of two for near-source applications (within 50 km of a source). Since PLUVUE is a Gaussian model, such limitations may also apply to visibility model calculations. However, we should point out that visual impacts are instantaneous phenomena, not 3-hour, 24-hour, or annual averages. Also, visual impacts are proportional to line-of-sight integrals of plume centerline NO_2 and aerosol concentrations, not to ground-level concentrations at a point.

For applications to distant class I areas (more than 50 km from the emissions source), the model is undoubtedly less accurate because of mesoscale wind speed, wind direction, and stability variations. Thus, the use of a Gaussian-based model for downwind distances greater than 50 km to predict visual effects is probably a conservative approach (i.e., it over-

estimates impacts); however, this has not yet been demonstrated conclusively. Visual impacts for horizontal lines of sight are inversely proportional to the vertical extent of plume mixing. This vertical extent of plume mixing is defined by the vertical plume dispersion parameter (σ_z) and, at farther downwind distances, by the mixing depth. Thus, errors in predicting vertical plume dimensions will carry throughout the calculations of plume visibility impacts. However, until field measurements of mesoscale plume transport and diffusion are carried out, and until better models based on these data are developed and verified, we do not know of a better approach to modeling plume dispersion for the purposes of visibility modeling than that provided in PLUVUE.

PLUVUE dispersion calculations are based on the standard Pasquill-Gifford σ_y and σ_z values. However, the PLUVUE user has the option to supply σ_y, σ_z values based on measurements or other σ_y, σ_z parameterizations, if these are demonstrated to be more appropriate for a given application.

Other limitations are basic to the chemical mechanism used in PLUVUE to predict conversion of sulfur and nitrogen oxides. Although this mechanism is a reasonable approximation for most applications in nonurban areas, it is not valid for applications in photochemical (urban) atmospheres or for sources of significant quantities of reactive hydrocarbons. For such applications, photochemical plume models or regional models should be used.

Other approximations are used in the atmospheric optics calculations. These approximations are discussed in Latimer et al. (1978). These approximations probably do not introduce significant errors in most situations; however, this has not been demonstrated yet. Terrain viewing backgrounds are idealized as white, gray, and black objects. The background atmosphere is treated as two layers: a homogeneous, surface mixed layer and a relatively clean upper atmosphere layer. Diffuse radiation is approximated using an analytical expression; errors in predicting diffuse radiation intensities may adversely affect the accuracy of spectral radi-

ance calculations but not necessarily the accuracy of calculations of plume contrast, color differences, and reduction in visual range.

In PLUVUE, the calculated visual impact of a plume is quantified using coloration, color difference, and contrast parameters that are related to human visual perception. However, the relationships between these optical parameters and the perceived scenic beauty of national parks and wilderness areas (which is the basic quality that the national visibility goal is designed to protect) are currently under study.

2 TECHNICAL OVERVIEW

This chapter briefly outlines the technical details of the plume visibility model (PLUVUE). Those interested in more detail should consult Latimer et al. (1978).

As shown schematically in figure 1, the modeling of visibility impairment requires mathematical descriptions for the following physical and chemical atmospheric processes in succession:

- Emissions.
- Atmospheric transport, diffusion, and removal.
- Chemical and physical reactions and transformations of precursors in the atmosphere.
- Light scattering and absorption characteristics of the resultant aerosol.
- Radiative transfer through the aerosol along different lines of sight.

Because the visibility model is based on atmospheric dispersion and chemistry models, the accuracy of the former depends on that of the latter. We recognize that future improvements in modeling dispersion--particularly on the regional scale and in complex terrain, as well as improvements in modeling secondary aerosol formation--will increase the accuracy of visibility models.

2.1 POLLUTANT TRANSPORT, DIFFUSION, AND REMOVAL

There are two scales that are of interest in visibility impairment calculations. They require two different types of models:

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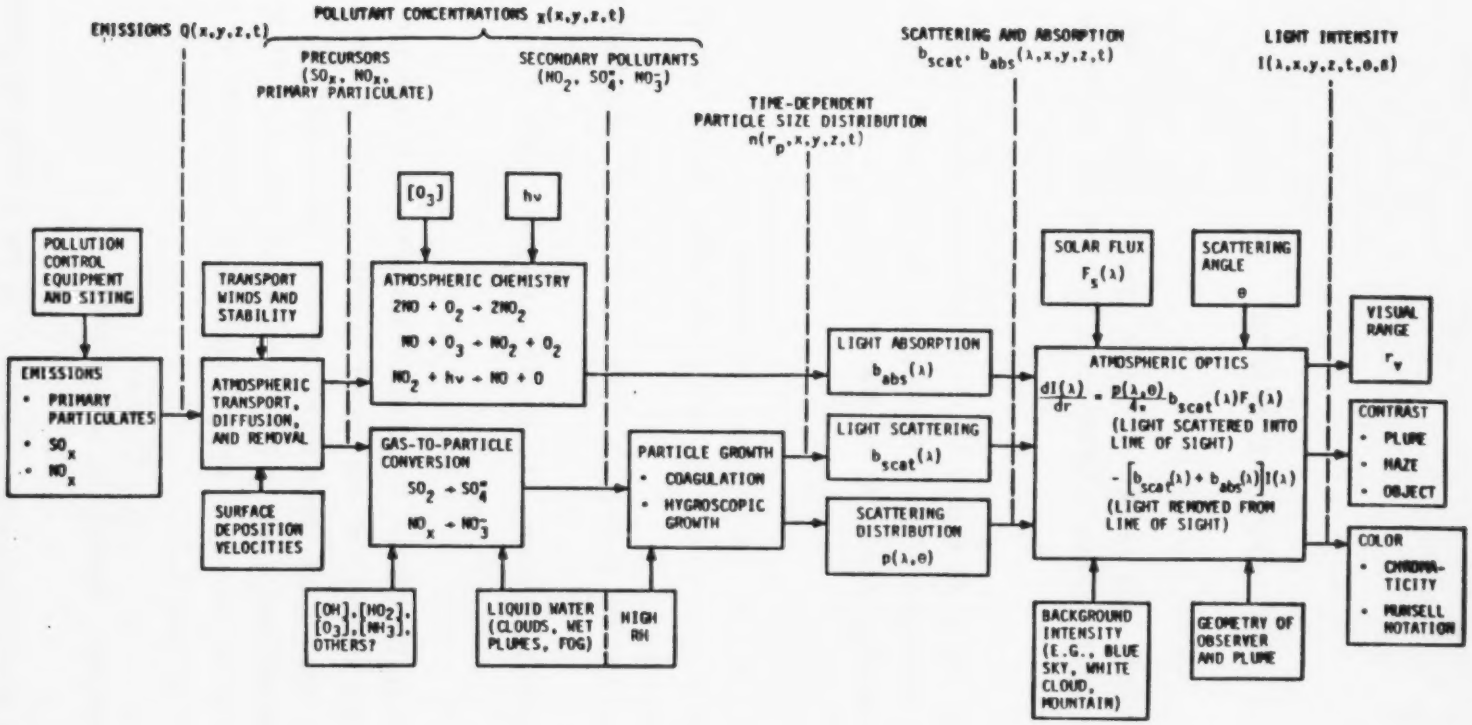


Figure 1. Schematic logic flow diagram of the plume visibility model.

- A near-source plume model designed to predict the incremental impact of one emissions source (such as a power plant or smelter).
- A regional model designed to predict, over time periods of several days, the impacts of several emissions sources within a region whose spatial scale is in the range of 1000 km.

Calculation of near-source visual impacts, which is the design objective of PLUVUE, requires a basic model that accurately predicts the spatial distribution of pollutants and the chemical conversion of NO to NO_2 and SO_x and NO_x to sulfates and nitrates. The plume model must be capable of handling the spatial scale from emissions at the source to at least 100 km downwind. Because the regional-scale problem may be caused by the long-range transport of pollutants over a spatial scale of 1000 km, an air quality model is needed that can account for multiple sources and for temporal variations in mixing heights, dispersion parameters, emission rates, reaction rates, and wind speed and direction. This second type of model, a regional visibility model, is beyond the scope of this user's manual. PLUVUE is a near-source plume visibility model.

In the following subsections, we discuss atmospheric dispersion modeling as it relates to the plume visibility model for the following spatial scales:

- Initial dilution in a buoyant plume
- Gaussian plume diffusion
- Limitations on mixing.

2.1.1 Initial Dilution in a Buoyant Plume

Modeling of the initial dilution of a plume from the top of the stack to the point of final plume rise is important when modeling the conversion of nitric oxide to nitrogen dioxide in a power plant plume because of the

quick quenching of the thermal oxidation of NO. The rate of this reaction is second order with respect to NO concentrations; therefore, the rate is fastest in the initial stages of plume dilution. It is also important to account for the initial dilution of buoyant releases because the rate of dilution caused by the turbulent entrainment of ambient air by a rising plume parcel can be considerably greater than that indicated by diffusion coefficients based on measurements for nonbuoyant releases (e.g., Pasquill-Gifford σ_y, σ_z). Thus, initial plume dilution during plume rise should be taken into account to calculate accurately both plume dilution and atmospheric chemistry.

Briggs (1969) suggested that the characteristic plume radius increases linearly with the height of the plume above the stack and can be represented as follows:

$$R_p = 0.5\ (\Delta h) \quad . \tag{1}$$

Briggs described plume rise, as a function of downwind distance (the "2/3 power law"), as follows:

$$\Delta h = 1.6\ F^{1/3} x^{2/3} u^{-1} \quad . \tag{2}$$

For initial dilution, we can assume that the plume is circular in cross section and has a Gaussian profile. We can also assume that the radius of the plume is the distance from the plume centerline to the point at which the plume concentration is 10 percent of the centerline concentration. Thus, we have

$$R_p = y_p = z_p = 2.15\ \sigma_y = 2.15\ \sigma_z \quad . \tag{3}$$

The concentration of a given species at the centerline of the plume can be calculated by a modified Gaussian model that can be represented as

$$\chi = \frac{Q}{2\pi\sigma_y \sigma_z V} \tag{4}$$

where V is the velocity of the parcel, which has a horizontal component (the wind speed u) and a vertical component w, which can be calculated by differentiating equation (2). Thus

$$w = \frac{dz}{dt} = \frac{2}{3}\ 1.6\ F^{1/3} u^{-1/3} t^{-1/3} \quad . \tag{5}$$

With this formulation, time-dependent plume temperature and NO concentrations can be calculated for accurately predicting the thermal oxidation of NO during plume rise.

Combining equations (1), (3), and (4), we can calculate the initial dilution of plume material, after the plume has reached its final height, as follows:

$$\chi = \frac{2.94\ Q}{(\Delta h)^2 u} \tag{6}$$

Thus, plume material is assumed to be at least as dilute as that shown by equation (6). For emissions sources having more than one stack, it is assumed that there is an overlap of plumes from individual stacks. For cases in which the initial dilution during plume rise is greater than the standard Gaussian formula would predict at the downwind distance of final plume rise, a virtual point-source offset is introduced so that dilution at this distance is at least as much as that shown in equation (6).

2.1.2 Plume Rise

The final plume rise in PLUVUE is calculated using the modified plume rise formulas of Briggs (1969, 1971, 1972):

For unstable or neutral atmospheric conditions, the downwind distance of final plume rise is $x_f = 3.5\ x^*$, where

$$x^* = \begin{cases} 14\ F^{5/8}, & \text{if } F < 55\ m^4 s^{-3} \\ 34\ F^{2/5}, & \text{if } F \geq 55\ m^4 s^{-3} \end{cases} \quad . \tag{7}$$

The final plume rise under these conditions is

$$\Delta h = 1.6\ F^{1/3}(3.5\ x^*)^{2/3} u^{-1} \quad . \tag{8}$$

For stable atmospheric conditions, the downwind distance of final plume rise is $x_f = \pi\ u\ s^{-1/2}$, where the stability parameter s is defined as follows:

$$s = g\ \partial\theta/\partial z\ T^{-1} \quad . \tag{9}$$

The plume rise for stable atmospheric conditions is

$$\Delta h = \text{minimum of} \begin{cases} 2.6(F/(u\ s)]^{1/3} \\ 5\ F^{1/4} s^{-3/8} \end{cases} \quad . \tag{10}$$

The buoyancy flux (F) in the above equations is calculated on the basis of the flue gas volumetric flow rate per stack ($\dot{V}$), flue gas and ambient temperature in degrees Kelvin (T_{stack}, $T_{ambient}$), and gravitational acceleration (g), as follows:

$$F = \frac{g\dot{V}}{\pi}\left(1 - \frac{T_{ambient}}{T_{stack}}\right) \quad . \tag{11}$$

2.1.3 Gaussian Plume Diffusion

After the plume has achieved its final height (about 1 km downwind), plume concentrations for uniform wind fields can be adequately predicted using a Gaussian model if the wind speed u at plume height H ($h_s + \Delta h$) and

the rate of diffusion are known for the particular situation so that diffusion coefficients (σ_y, σ_z) can be selected:

$$\chi = \frac{Q}{2\pi\sigma_y\sigma_z u} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right]\left\{\exp\left[-\frac{1}{2}\left(\frac{H+z}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{H-z}{\sigma_z}\right)^2\right]\right\} . \quad (12)$$

Equation (12) is appropriate for a conservative species and can be modified to be appropriate for a nonconservative species by changing the source term Q.

It is necessary for calculating plume visual impact to integrate, along the line of sight, the plume extinction coefficient, the magnitude of which depends on primary and secondary particulate and nitrogen dioxide concentrations. Equation (12) can be integrated [Ensor, Sparks, and Pilat (1973)] in the cross-wind direction y, from $y = -\infty$ to $y = +\infty$, to obtain the optical thickness of the plume:

$$\tau_{py} = \int_{-\infty}^{+\infty} b_{ext}\, dy = \frac{Q'(x)}{(2\pi)^{1/2}\sigma_z u}\left\{\exp\left[-\frac{1}{2}\left(\frac{H+z}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{H-z}{\sigma_z}\right)^2\right]\right\} , \quad (13)$$

where b_{ext} is the incremental increase in extinction coefficient in the plume and Q' is the flux of the plume extinction coefficient over the entire plume cross section at downwind distance x. In the vertical direction z, from $z = 0$ to $z = +\infty$, the plume optical thickness is

$$\tau_{pz} = \int_0^{\infty} b_{ext}\, dz = \frac{Q'(x)}{(2\pi)^{1/2}\sigma_y u} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] . \quad (14)$$

2.1.4 Observer-Plume Orientation

The magnitude of the visual impact of a plume depends on the orientation of the observer with respect to the plume because the plume optical thickness will vary depending on this orientation. Figure 2 shows plan and elevation views of an observer and a plume and indicates that the sight path distance through the constituents of the plume is a function of angles α and β. The optical thickness for most combinations of angles α and β can be approximated as follows:

$$\tau_p(\alpha,\beta) = \frac{1}{\sin \alpha}\left[\left(\tau_{py} \cos \beta\right)^2 + \left(\tau_{pz} \sin \beta\right)^2\right]^{1/2} \quad . \qquad (15)$$

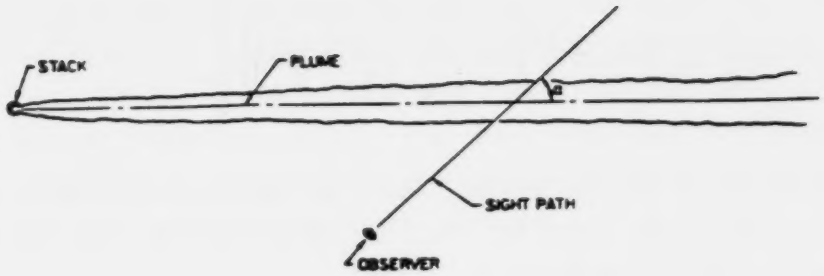
Figure 2 suggests that plume optical thickness is greater for horizontal sight paths than vertical ones, particularly during stable conditions when the plume cross section is flattened.

2.1.5 Limited Mixing

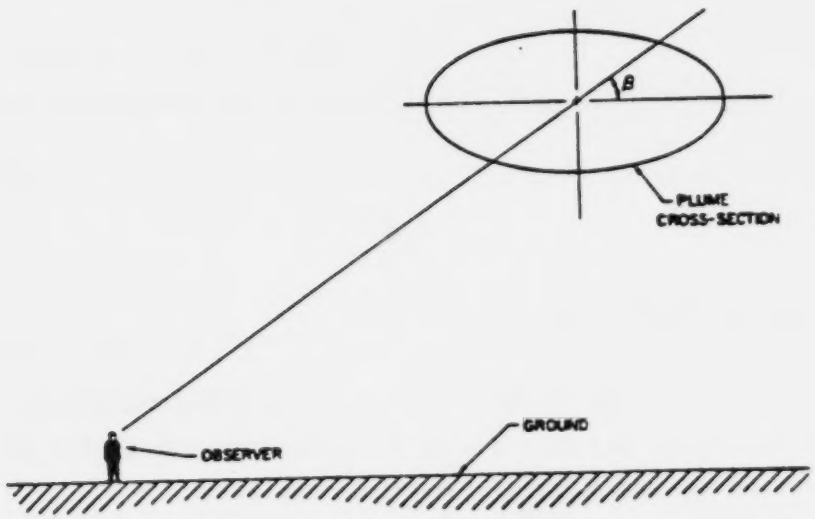
When vertical diffusion is limited by a stable capping layer, equation (12) is no longer valid, and a Gaussian formulation, with terms for reflection from the top of the mixed layer (at altitude H_m), is used. Let H' be the height of the virtual source positioned above the top of the mixed layer:

$$H' = 2\,H_m - H \quad .$$

The Gaussian formulation for limited mixing is



(a) Plan View



(b) Elevation View

Source: Latimer and Samuelsen (1978).

Figure 2. Gaussian plume visual impact model: observer-plume geometry.

$$\chi = \frac{Q}{2\pi\,\sigma_y\sigma_z\,u}\exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right]\left\{\exp\left[-\frac{1}{2}\left(\frac{H+z}{\sigma_z}\right)^2\right]+\exp\left[-\frac{1}{2}\left(\frac{H-z}{\sigma_z}\right)^2\right]\right.$$
$$\left.+\exp\left[-\frac{1}{2}\left(\frac{H'-z}{\sigma_z}\right)^2\right]+\exp\left[-\frac{1}{2}\left(\frac{H'+z}{\sigma_z}\right)\right]\right\} \quad . \tag{16}$$

In this instance of limited mixing, the plume material eventually becomes uniformly mixed in the vertical direction for $0 \leq z \leq H_m$. In the limit, the concentration is expressed as follows:

$$\chi = \frac{Q}{(2\pi)^{1/2}\,\sigma_y u H_m}\exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \quad . \tag{17}$$

The calculation of plume optical thickness in the y-direction becomes simply

$$\tau_{py} = \frac{Q'(x)}{uH_m} \quad . \tag{18}$$

2.1.6 Surface Deposition

Surface deposition is calculated by integrating the plume concentrations at the ground and multiplying by a deposition velocity, V_d, that characterizes gas and particulate surface depletion:

$$-\frac{dQ}{dx} = V_d \int \chi\, dy \tag{19}$$

Since nocturnal ground-based stable layers shield a plume from the ground at night, surface deposition is effectively zero at night. This is handled in the model using a flag keyed to the time of day at which the plume parcel is at a given downwind distance.

2.1.7 Power Law Wind Profile Extrapolation of Surface Winds

PLUVUE is designed to use either wind speed aloft or surface wind speed (commonly measured at 7 m above the surface). The power law extrapolation presented in "User's Manual for a Single-Source (CRSTER) Model" (EPA, 1977) is used. The surface wind speed is extrapolated to stack height for the plume rise calculation, and the surface wind speed is extrapolated to the final plume height for Gaussian concentration calculations. The power law extrapolation is as follows:

$$u = u_0 (z/7)^p \qquad (20)$$

where

u = wind speed at altitude z (ms^{-1})
u_0 = surface wind speed (ms^{-1})

The profile exponent p is a function of stability and has the following values:

Pasquill Stability Class		Wind Speed Profile Exponent (p)
A	Extremely unstable	0.10
B	Moderately unstable	0.15
C	Slightly unstable	0.20
D	Neutral	0.25
E	Slightly stable	0.30
F	Moderately stable	0.30

2.2 ATMOSPHERIC CHEMISTRY

As shown in figure 1, the conversion of emissions of nitric oxide (NO) and sulfur dioxide (SO_2) to nitrogen dioxide (NO_2) gas and sulfate ($SO_4^=$) aerosol--species responsible for visual effects--must be calculated in the visibility model.

The rate of chemical conversion of these primary emissions to secondary species responsible for visual impact is dependent on the concentration of the reacting species and ultraviolet (UV) solar flux. Thus, conversion rates are dependent on both plume dilution and time of day. A plume parcel at a given downwind distance has a specific age, time of emission, and history of UV irradiation, which can affect the amount of NO_2 and $SO_4^=$ in the plume at a given time. Thus, the chemical conversion in each plume parcel must be treated separately, taking into account these factors.

PLUVUE is structured to take a "snapshot" of a plume at a given time. In PLUVUE, the chemical conversion is calculated for each plume parcel, observed at a given distance, in a Lagrangian manner; i.e., the reaction rates are calculated at each of several discrete downwind distances and times from the point of emission to the downwind distance at which the plume parcel is observed. Thus, the age of a plume parcel observed at downwind distance x_{obs} is x_{obs}/u, where u is the wind speed. The time at which a plume parcel is at a given downwind distance relates to the time of observation as follows:

$$t = t_{obs} - \frac{x_{obs} - x}{u} \qquad (21)$$

The UV flux is calculated as a function of time that a plume parcel is at a given downwind distance x from the solar zenith angle (i.e., the angle between direct solar rays and the normal to the earth's surface). The zenith angle is calculated on the basis of the latitude, longitude, date, and time using a subroutine developed by Schere and Demerjian (1977).

The rate of chemical conversion is also dependent on the location of the plume parcel within the plume. PLUVUE makes calculations at the following altitudes within the plume (y = 0): at the plume centerline (z = H) and at $z = H \pm n\ \sigma_z$, where n = 1 and 2.

2.2.1 Conversion of NO to NO_2

Nitrogen dioxide gas can cause a yellow-brown discoloration of the atmosphere. Although some discoloration is a result of wavelength-dependent light scattering caused by submicron aerosol, as discussed in the workbook of this regulatory guidance series, the dominant colorant of power plant plumes is NO_2, which causes a yellow-brown discoloration that may be apparent at significant distances downwind of large coal-fired power plants, particularly in areas where the background visual range is excellent.

Very little NO_2 is emitted directly from combustion sources. However, colorless nitric oxide is formed by the thermal oxidation of atmospheric nitrogen at the high temperatures experienced in the combustion zone (the boiler in a power plant) and the oxidation of nitrogen that may be present in the fuel. Chemical reactions in the atmosphere can form sufficient NO_2 from NO to cause atmospheric discoloration. Available measurements of NO and NO_2 concentrations in power plant plumes in non-urban areas suggest that the conversion of NO to NO_2 can be calculated from a simple set of three reactions.*

The first of these is the thermal oxidation of NO to NO_2:

$$2NO + O_2 \rightarrow 2NO_2 \quad . \tag{22}$$

The reaction is termolecular, but bimolecular with respect to NO; it is therefore very fast at high concentrations of NO but slow at the lower concentrations that exist in the atmosphere or in a plume. The reaction rate for equation (22), based on Baulch, Drysdale, and Horne (1973) is

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* In urban areas, a complete photochemical mechanism should be applied to calculate NO_2 concentrations. Also, it should be noted that NO_2 is destroyed by reaction with the hydroxyl radical ($OH\cdot$), as discussed in the next subsection.

$$\frac{d[NO_2]}{dt} = \left[4.015 \times 10^{-12} \exp\left(\frac{1046}{RT}\right)\right][NO]^2[O_2] \text{ ppm/s} \quad . \qquad (23)$$

where R is the universal gas constant and T is the absolute temperature.

The reaction with ozone also affects the conversion of NO to NO_2:

$$NO + O_3 \rightarrow NO_2 + O_2 \quad . \qquad (24)$$

The reaction is fast, with a rate (Leighton, 1961; Davis, Smith, and Klauber, 1974; Niki, 1974) at 25°C of

$$\frac{d[NO_2]}{dt} = 0.44\ [NO][O_3] \text{ ppm/s} \quad . \qquad (25)$$

This reaction accounts for the ozone depletion measured within power plant plumes and is important because ozone concentrations can be high even in nonurban regions. Measured ozone concentrations in nonurban areas of the western United States range from 0.02 to 0.08 ppm.

Whereas the thermal oxidation rate in reaction (23) decreases as the plume mixes (because the NO concentration decreases), the formation of nitrogen dioxide via equation (24) is enhanced as the plume mixes because additional ozone from the atmosphere is mixed into the plume, allowing equation (24) to proceed. When there are no reactions converting NO_2 to NO (e.g., at night), equation (24) proceeds until all of the NO in the plume is converted to NO_2 or until the ozone concentration in the plume drops to zero. Therefore, the rate of conversion of NO to NO_2 via equation (24) is limited by the rate of plume mixing that provides the necessary atmospheric ozone.

To complete the set of chemical reaction mechanisms, we must consider the photolysis of NO_2. When sunlight illuminates a plume containing nitrogen dioxide, short wavelength light and ultraviolet radiation are absorbed by the NO_2. As noted above, absorption of the shorter wavelength

light produces the characteristic yellow-brown color associated with NO_2. Absorption of the more energetic ultraviolet light (UV) results in dissociation of the NO_2 molecule:

$$NO_2 + h\nu \rightarrow NO + O \quad . \tag{26}$$

$$O + O_2 \rightarrow O_3 \quad . \tag{27}$$

Leighton (1961) gave the rate of reaction (26) as

$$\frac{d[NO_2]}{dt} = -K_d\,[NO_2] \text{ ppm/s} \quad , \tag{28}$$

where K_d depends on the amount of light incident on the nitrogen dioxide. Davis, Smith, and Klauber (1974) gave the following expression for K_d as a function of the solar zenith angle Z_s:

$$K_d = 1 \times 10^{-2} \exp\left(-\frac{0.38}{\cos Z_s}\right) s^{-1} \quad . \tag{29}$$

With this set of chemical reactions, the chemical conversion of NO to NO_2 in the atmosphere can be calculated from background pollutant concentrations and from plume NO_x increments using the technique suggested by Latimer and Samuelsen (1975) and White (1977). Making the steady-state approximation, we have

$$[NO_2] = \frac{K_r}{K_d}\,[NO][O_3] \quad , \tag{30}$$

where

$$[NO] = [NO_x] - [NO_2] \tag{31}$$

and

$$[O_3] = [O_3]_b - [NO_2] - [NO_2]_t - [NO_2]_b \quad . \tag{32}$$

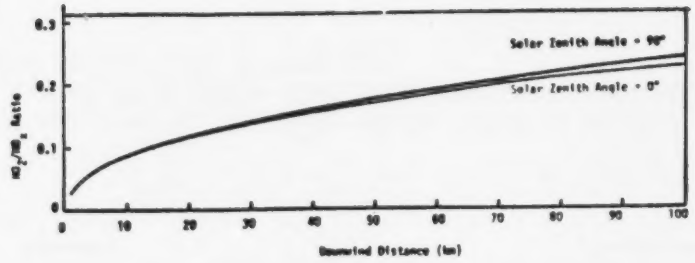
where $[NO_2]t$ signifies the concentration of NO_2 formed via the termolecular reaction (22) and $[NO_2]b$ signifies background concentrations. Substituting equations (28) and (29) into equation (27) we can solve for the concentration of NO_2:

$$[NO_2] = 0.5 \left[[NO_x] + [O_3]_b + [NO_2]_t + [NO_2]_b + \frac{K_d}{K_r} - \left\{ \left([NO_x] + [O_3]_b + [NO_2]_t + [NO_2]_b + \frac{K_d}{K_r} \right)^2 - 4[NO_x] \left([O_3]_b + [NO_2]_t + [NO_2]_b \right) \right\}^{1/2} \right] . \quad (33)$$

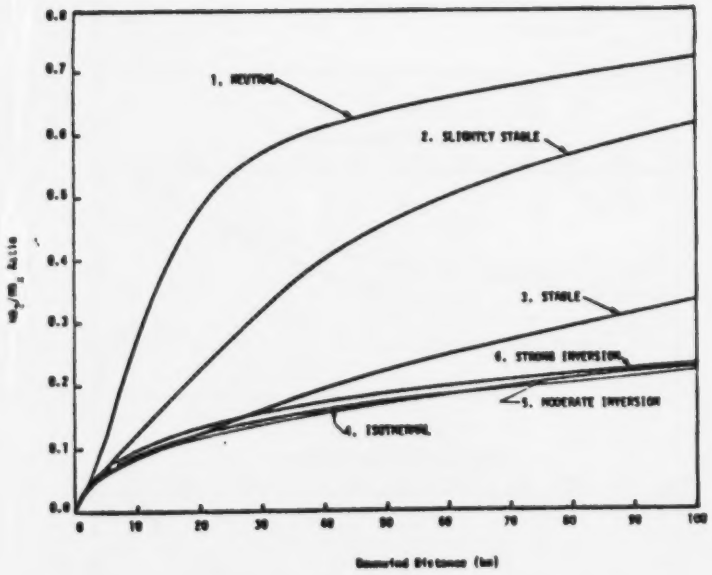
Using this formulation to compute NO-to-NO_2 conversion in a hypothetical power plant plume, Latimer and Samuelsen (1978) studied the sensitivity of NO_2 formation to the rate of plume dilution, background ozone concentration, and solar radiation. The results of this analysis are presented in figure 3. This figure shows that thermal oxidation (e.g., $[O_3] = 0$) converts up to 10 percent of the plume NO to NO_2, and additional conversion results when ambient ozone is mixed into the plume. A recent comparison of observations with calculations using equation (33) indicates good agreement, particularly if the diffusion of the plume is correctly calculated by using fitted diffusion coefficients based on plume diffusion measurements (see figure 4).

2.2.2 Conversion of SO_2 to $SO_4^=$

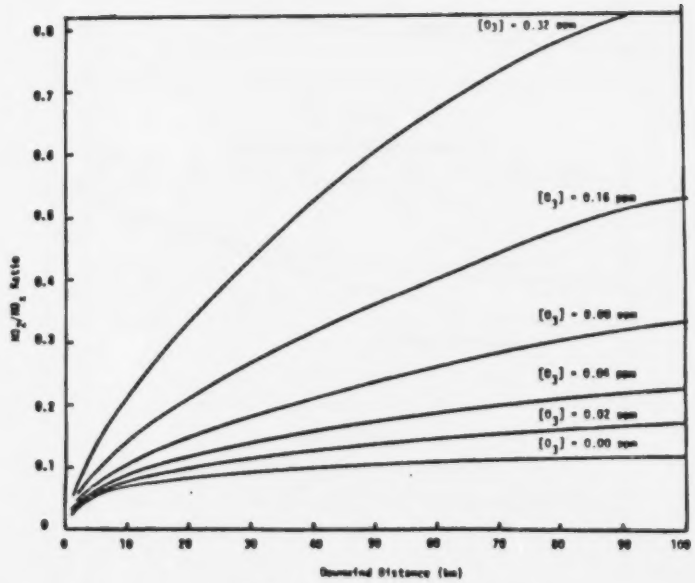
It is critical to calculate the conversion of SO_2 emissions to sulfate ($SO_4^=$) aerosol, because the latter can effectively scatter light and cause reductions in visual range. The importance of SO_2 to$SO_4^=$ conversion can be seen from the schematic logic flow shown in figure 1. The usual approach is to assume that sulfur dioxide (SO_2) gas is converted to sulfate ($SO_4^=$) aerosol at some constant rate; this approach employs a user-input value of a pseudo-first-order rate constant whose value is empirically determined.



(a) Solar radiation



(b) Stability (TVA stability categories)



(c) Background ozone

Source: Latimer and Samuelsen (1978).

Figure 3. Sensitivity of NO-to-NO_2 conversion in power plant plumes to the rate of plume dilution, background ozone concentration, and solar radiation.

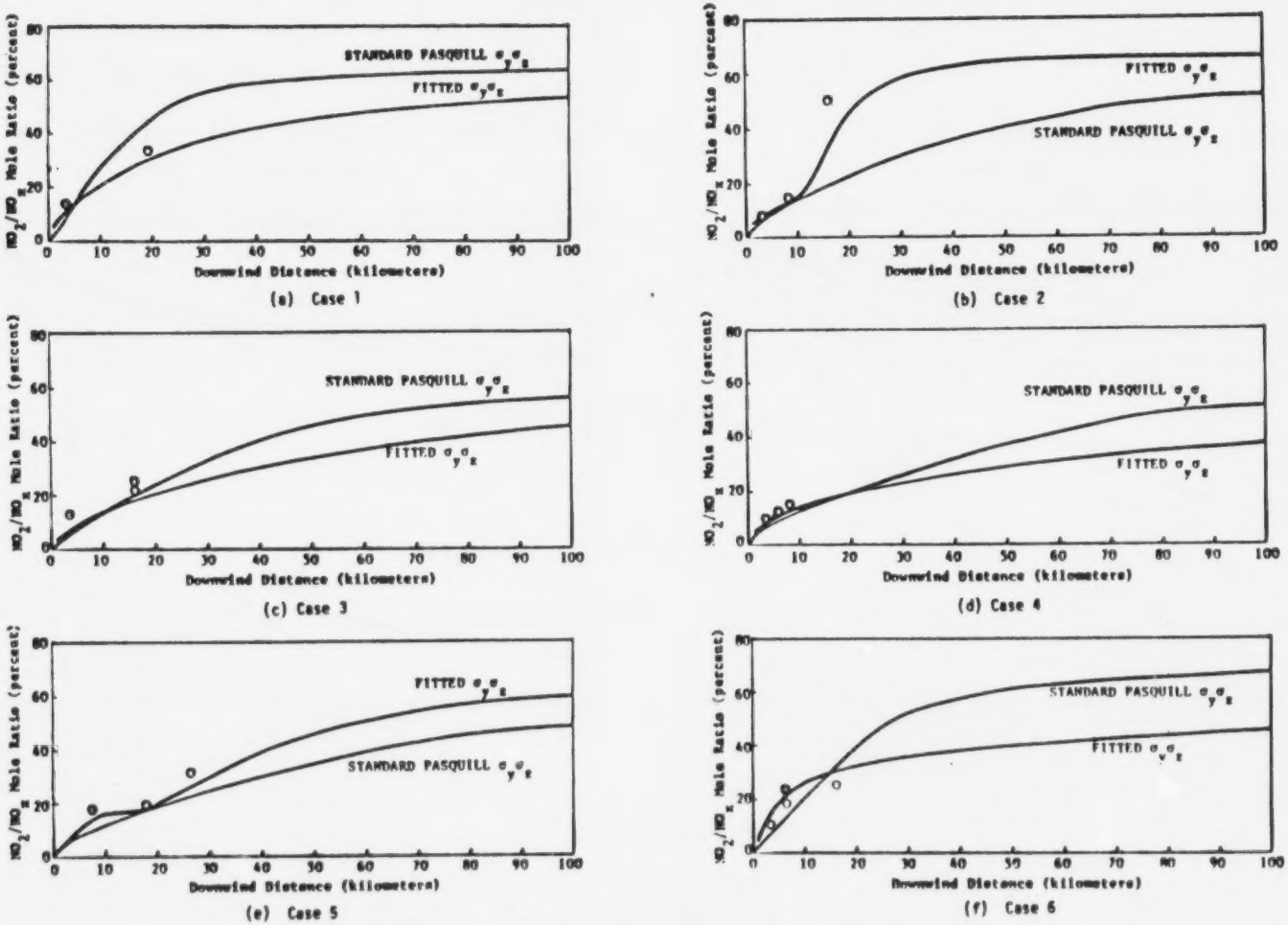


Figure 4. Comparison of measured NO_2/NO_x mole ratios (circled points) in the plume centerline downwind of a coal-fired power plant with computer-calculated values (solid lines) using standard Pasquill and fitted $\sigma_y\sigma_z$.

There is considerable variation, however, in such measured SO_2-to-$SO_4^=$ conversion rates, which range from a few tenths of a percent to several percent per hour. Much of this variance in SO_2-to-$SO_4^=$ conversion observed in field measurement programs in recent years can be explained using a model that accounts for the reactions of plume SO_2 and NO_2 with the hydroxyl (OH•) radical. This chemical mechanism is incorporated in PLUVUE. In clean background areas, the gas-phase oxidation of SO_2 and NO_2 to sulfate aerosol and nitrate (nitric acid vapor) is due primarily to the reaction of these species with OH•. Previous assessments of homogeneous (gas-phase) oxidation of SO_2 to sulfate estimated the proportion assignable to the reaction with hydroxyl between about 75 percent in clean atmospheres (Calvert et al., 1978; Altshuller, 1979) and as low as 40 percent in polluted urban air (Isaksen, Hesstredt, and Hov, 1978), but more recent estimates place these values much higher. Kinetic models forming the basis of the early estimates used the value of $1.3 \times 10^{-12} cm^3 mol^{-1} s^{-1}$ for the rate constant of reaction for HO_2 and CH_3O_2 with NO. More recently, however, this rate has been measured at $8.1 \times 10^{-12} cm^3 mol^{-1} s^{-1}$ (Hampson and Garvin, 1978). This larger rate constant lowers the expected concentration of these peroxy radicals by a factor of 6 and, in turn, greatly reduces the SO_2 conversion resulting from reactions with these radicals. When recalculated using the new rate constant, the fraction of SO_2-to-sulfate conversion that results from reaction with the hydroxyl radical is approximately 95 percent for clean atmospheres and 70 percent for the extremely polluted case.

These estimates are supported by the work of Miller (1978), who found that the SO_2 oxidation rate was not dependent on the absolute concentrations of hydrocarbons and nitrogen oxides but on the ratio of nonmethane hydrocarbon to nitrogen oxides.

The rate of sulfate (and nitric acid) formation can be estimated by calculating the steady-state concentration of OH• within a plume. This steady-state plume OH• concentration is calculated by balancing the rate of OH• production with the rate of OH• destruction. The following reactions are used:

> OH• production*

- $O_3 + h\nu \rightarrow O(^1D) + O_2$

$$\left[\left(K_{34} = 1.3 \times 10^{-3} (\cos Z_s)^{2.74} \text{min}^{-1}\right)\right] \quad (34)$$

- $O(^1D) + M \rightarrow O(^3P) + M \quad (K_{35} = 4.45 \times 10^{10} \text{min}^{-1})$ (35)

- $O(^1D) + H_2O \rightarrow 2\ OH\bullet \quad (K_{36} = 3.4 \times 10^{5} \text{ppm}^{-1}\text{min}^{-1})$ (36)

> OH• destruction (major sinks in plumes)

- $OH\bullet + SO_2 \rightarrow HSO_3 \ldots \quad (K_{37} = 2.0 \times 10^{3} \text{ppm}^{-1}\text{min}^{-1})$ (37)

- $OH\bullet + NO_2 \rightarrow HNO_3 \quad (K_{38} = 1.4 \times 10^{4} \text{ppm}^{-1}\text{min}^{-1})$. (38)

With the assumption of steady-state concentrations of $O(^1D)$ and OH• in the plume, we can write the following equations:

$$\frac{d[OH\bullet]}{dt} = \frac{d[O'(D)]}{dt} = 0 \quad , \quad (39)$$

$$\frac{d[O(^1D)]}{dt} = K_{34}(h\nu)[O_3] - K_{35}[O(^1D)] - K_{36}[O'(D)][H_2O] \quad , \quad (40)$$

$$[O(^1D)] = \frac{K_{34}(h\nu)[O_3]}{K_{35} + K_{36}[H_2O]} \quad , \quad (41)$$

---

* See Latimer et al. (1980) for a discussion of other sources of OH•. Rate constants are based on Whitten and Killus (1980), private communication.

$$\frac{d[OH\cdot]}{dt} = 2\,K_{36}[O('D)][H_2O] - K_{37}[OH\cdot][SO_2] - K_{38}[OH\cdot][NO_2] \quad , \tag{42}$$

$$[OH\cdot] = \frac{2\,K_{36}[O('D)][H_2O]}{K_{37}[SO_2] + K_{38}[NO_2]} \quad . \tag{43}$$

With this steady-state concentration, plume pseudo-first-order SO_2-to-SO_4 and NO_2-to-HNO_3 conversion rates can be calculated as follows:*

$$-\frac{1}{[SO_2]}\frac{d[SO_2]}{dt} = K_{37}[OH\cdot] \quad , \tag{44}$$

$$-\frac{1}{[NO_2]}\frac{d[NO_2]}{dt} = K_{38}[OH\cdot] \quad . \tag{45}$$

Note from equations (41) and (42) that plume OH• concentrations are reduced below background tropospheric values for two reasons:

> Plume ozone (O_3) concentrations are reduced below background values because of the reaction $NO + O_3 \rightarrow NO_2 + O_2$ (eq. 24).

> Plume concentrations of NO_2 and SO_2 are high, thus reducing steady-state OH• concentrations.

It should be pointed out that at night there is no production of OH• from ozone photolysis; also, in early morning and late afternoon and in winter OH• production is diminished because ultraviolet flux decreases as solar zenith angles approach 90°. Thus, sulfate and nitrate are not formed at

---

* The user is given the option in PLUVUE of supplementing the SO_2-to-$SO_4^=$ conversion rate calculated on the basis of steady-state plume OH• concentrations with a user-input pseudo-first-order rate constant, which can be varied as a function of downwind distance.

night and are formed only very slowly in concentrated plumes. Nitrate is expected to remain as HNO_3 vapor and without visual effects until it is eventually deposited. Ammonium nitrate could exist in aerosol form; however, sulfate competes for available atmospheric ammonia.

PLUVUE was run, with this OH• chemical mechanism included, for a plume from a 1600 Mwe coal-fired power plant. On the basis of this case study, the effect of the following on sulfate formation rate was studied:

> Plume dilution, corresponding to neutral and stable light-wind conditions at various downwind distances.
> Time of day.
> Season.

The history of sulfate formation in a plume parcel based on this case study is shown in figure 5. Note that time of day, season, and plume concentration all affect the rate of sulfate formation. This effect is explained by the formulations shown in equations (41), (43), and (44).* The SO_2-to-$SO_4^=$ conversion rate is directly proportional to the plume ozone and water vapor concentrations and to ultraviolet (UV) flux, and it is inversely proportional to plume SO_2 and NO_2 concentrations.

The effect of UV flux is noted in both the seasonal and time-of-day dependence of the sulfate formation rate. Note from figure 5 that no conversion of SO_2 to sulfate occurs at night. Sulfate formation starts after sunrise, reaches its maximum rate at noon (when ultraviolet flux reaches a maximum), and then begins to decrease. Thus, a plume parcel observed at a given distance downwind from a power plant may have undergone sulfate formation during only a fraction of its journey. For example, a plume parcel

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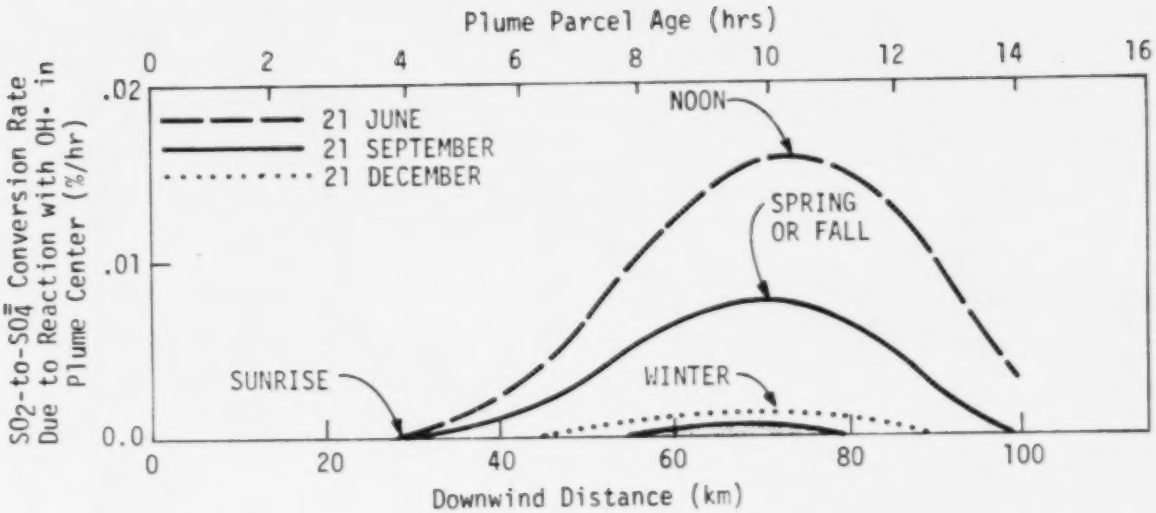
* It should be noted that sulfate can form not only by reactions with OH• but also on existing, catalytic fly ash particles. However, this sulfate coating on existing particles is not expected to significantly add to aerosol surface area, which is important for light scattering.



Notes:

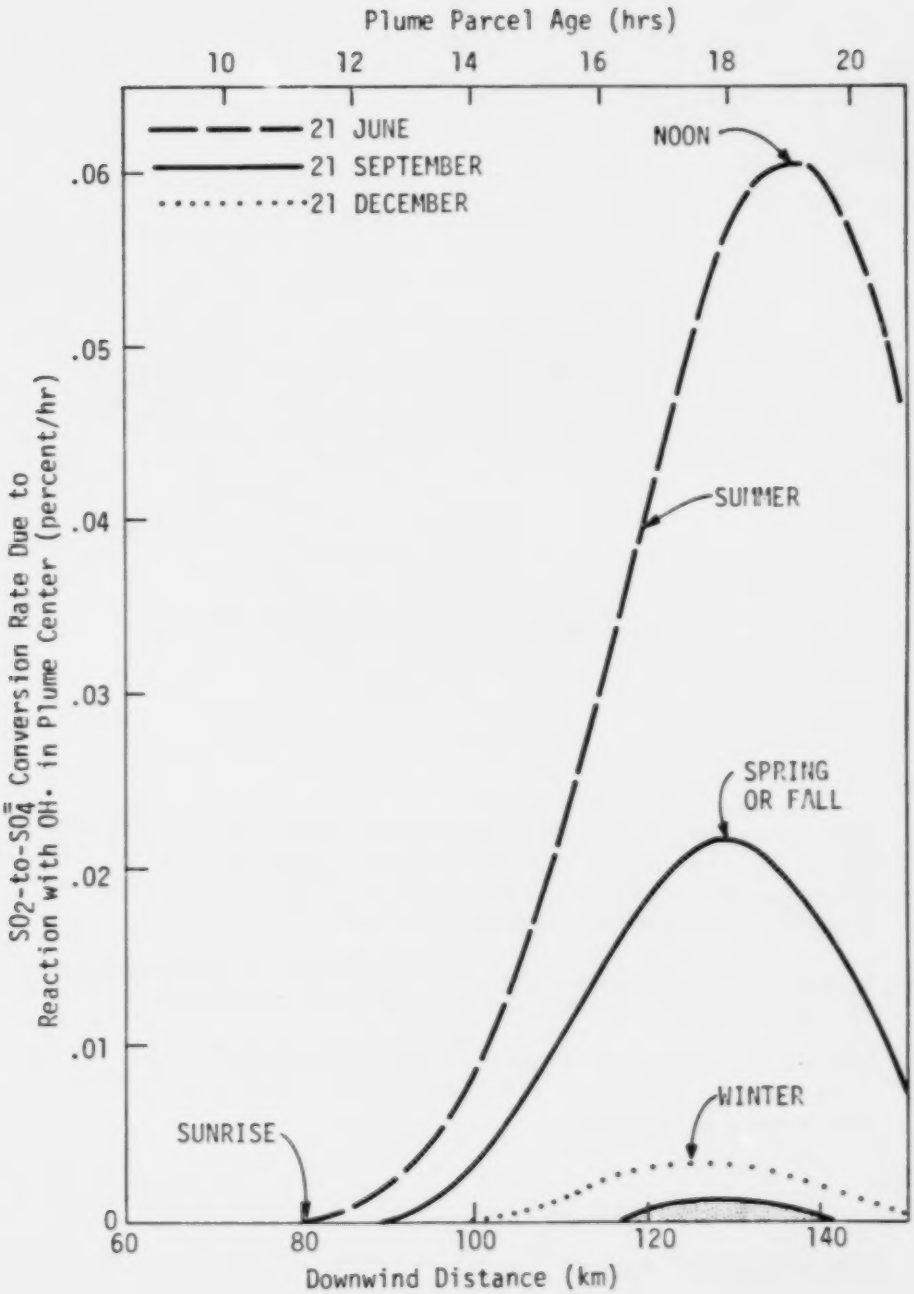
(1) Time-dependent SO_2-to-$SO_4^=$ conversion rates for the history of a parcel in the center of a well-mixed plume (neutral stability) which is observed 100 km downwind at 1500 (in the afternoon) are plotted for indicated seasons in Figure 5(a).

(2) Comparable conversion rates for a well-mixed plume observed 160 km downwind at 1500 are plotted in Figure 5(b).

(3) Conversion rates for stable plumes (isothermal stability) are considerably less than 0.01 percent/hr. See shaded areas at the bottom of graphs.

(a) Life history of a plume parcel observed 100 km downwind at 1500 hours.

Figure 5. Calculated time dependence of sulfate formation in the center of plumes from a 1600 Mwe coal-fired power plant, 2 m/s winds, neutral and stable conditions



(b) Life history of a plume parcel observed 160 km downwind at 1500 hours.

Figure 5 (concluded)

160 km downwind of its source, when winds are 2 m/s, would require a transit time of more than 22 hours. During this period sulfate would be formed only during the sunlight hours [see figure 5(b)].

The effect of plume SO_2 and NO_2 concentrations on the steady-state $OH\cdot$ concentration and hence on sulfate formation is also shown in figure 5. Note, by comparing figure 5(a) with 5(b), that sulfate formation is much more rapid when plume parcels are more dilute (at farther downwind distances). In the dilute, neutral-stability plumes at downwind distances greater than 100 km, sulfate formation rates reach noon peaks of about 0.06, 0.02, and 0.004 percent per hour, respectively, for the summer, fall, and winter simulations for this latitude. In the less dilute, neutral-stability plumes at downwind distances of less than 100 km, the sulfate formation rates peak at 0.016, 0.008, and less than 0.002 percent per hour for summer, fall, and winter, respectively. However, formation rates in stable plumes are considerably less than 0.01 percent per hour even at noon on a summer day.

These model calculations support the argument made by Latimer (1980) that the atmospheric discoloration of stable power plant plumes (where particulate emissions are controlled) is caused primarily by nitrogen dioxide (NO_2) gas, not by secondary sulfate aerosol. Sulfate aerosol is not formed in plumes during nighttime transport, and formation is minimal during daytime transport when plumes are concentrated (as they would be during stable conditions). After plumes have become well mixed, significant rates of sulfate formation can occur in the daytime, though these rates approach zero with low sun angles. Thus, sulfate formation is a long range (greater than 100 km), multiday phenomenon, not a near-source problem.

2.3 AEROSOL SIZE DISTRIBUTION

The aerosol size distribution is characterized by a series of aerosol modes, each having a log-normal distribution of mass (or volume). Each of the following modes is treated separately in PLUVUE:

- Background accumulation mode (submicron) aerosol (typically having a mass median diameter of about 0.3 μm and a geometric standard deviation of 2).
- Background coarse mode (> 1 μm) aerosol (typically having a mass median diameter of about 6 μm and a geometric standard deviation of 2).
- Plume primary particulate aerosol (e.g., fly ash emissions).
- Plume secondary sulfate ($SO_4^=$) aerosol (typically having a mass median diameter of 0.1 to 0.3 μm and a geometric standard deviation of 2).

The expression developed by Winkler (1973) is used to calculate the amount of liquid water associated with submicron background and plume sulfate aerosol as a function of relative humidity.

Secondary aerosol is assumed to form in the submicron plume secondary aerosol mode. A time delay equal to the time between successive downwind distances is introduced to account for coagulation and condensation time delays.

2.4 ATMOSPHERIC OPTICS

In the atmospheric optics component of the plume visibility model, the light scattering and absorption properties of the aerosol and the resultant light intensity (spectral radiance) for various illumination and viewing situations are computed. The details of these calculations are given in appendix B of Latimer et al. (1978); the major points are summarized in this section.

2.4.1 Calculation of the Scattering and Absorption Properties

After the concentrations of the pollutants are specified by the transport and chemistry subroutines, their radiative properties must be

determined. For NO_2, the absorption at a particular wavelength is a tabulated function (Dixon, 1940) multiplied by the concentration. For aerosols, however, the procedure is more complicated.

In general, a particle's ability to scatter and absorb radiation at a particular frequency is a function of size, composition, shape, and relative humidity. The flexibility to specify the size distribution of both primary and secondary particles was desired. Therefore, the effect of particle size on the wavelength dependence of the extinction coefficient and the phase function, the solution of Maxwell's equations for scattering by a sphere, and the so-called Mie equations were used in PLUVUE. These calculations are appropriate for atmospheric aerosol; comparisons of Mie calculations, with empirical correlations of scattering-to-mass indicate substantial agreement.

The Mie calculations in PLUVUE are performed using an IBM subroutine written by J. V. Dave (Dave, 1970). The required inputs are the particle size parameter (ratio of the circumference to the wavelength of radiation), the index of refraction (real and imaginary part), and the number and location of absorption cross sections and the Stokes transformation matrix (Van De Hulst, 1957), which can be simply converted to the scattering distribution assuming randomly polarized light. The scattering and absorption properties per particle are then summed over the particular log-normal size distribution for the given aerosol mode.

2.4.2 Calculation of Light Intensity

The light intensity, or radiance (watts/m^2/steradian) at a particular location in the atmosphere is a function of the direction of observation Ω and the wavelength λ. Calculation of the light intensity in a medium follows from the radiative transfer equation. This equation is a conservation of energy statement that accounts for the light added to the line of sight by scattering and the light lost because of absorption and scattering. Approximations and solution techniques applicable to planetary atmospheres have been discussed by Hansen and Travis (1974) and Irvine (1975).

The physical situation that we are concerned with is shown schematically in figure 6. To compute the spectral light intensity at the observer, we sum (integrate) the scattered and absorbed light over the path, r, associated with the line of sight Ω. The resultant general expression for the background sky intensity at a particular wavelength is

$$I_b(\Omega) = \int_0^{\tau_\infty} \frac{\omega(\tau)}{4\pi} \int_{\Omega'=4\pi} I(\Omega', \tau') p(\Omega' \rightarrow \Omega, \tau') \, d\Omega' \, e^{-\tau'} \, d\tau' \quad , \quad (46)$$

where

τ = the optical depth ($\tau \equiv \int_0^r b_{ext} \, dr$, where b_{ext} is the extinction coefficient),

ω = the albedo for single scattering ($\omega \equiv b_{scat}/b_{ext}$ where b_{scat} is the scattering coefficient),

$p(\Omega' \rightarrow \Omega)$ = the scattering distribution function for the angle $\Omega' \rightarrow \Omega$),

I = the spectral intensity at τ' from direct and diffuse solar radiation.

The intensity seen by an observer in direction Ω of a background viewing object of intensity I_o at distance R is

$$I_{obj}(\Omega) = I_o(\Omega) e^{-\tau_R}$$

$$+ \int_0^{\tau_R} \frac{\omega(\tau')}{4\pi} \int_{\Omega'=4\pi} I(\Omega', \tau) \, p(\Omega' \rightarrow \Omega, \tau') \, d\Omega' \, e^{-\tau'} \, d\tau' \quad . \quad (47)$$

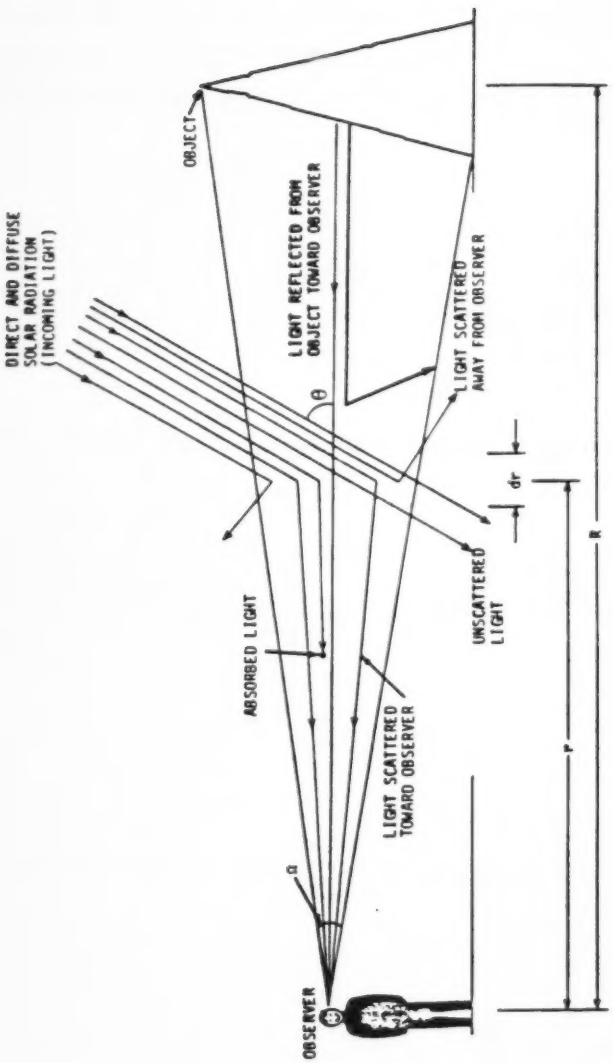


Figure 6. Light scattering and absorption in the atmosphere.

Equations (46) and (47) then completely describe the spectral intensity of the sky and a background object. Once these two quantities are known, the visual effects of the intervening atmosphere can be quantified. In evaluating equations (46) and (47), we encounter two main difficulties: First, the quantity in the integral is a fairly complicated function, and accurate specification is tedious. Second, the atmosphere is inherently inhomogeneous; thus, the radiative properties ω, p are somewhat complicated functions of r and Ω. The following approximations are therefore made in PLUVUE:

> Plane parallel atmosphere
> Two homogeneous layers
> Average solar flux approximation
> Average diffuse intensity approximation.

The equation for the background intensity at the surface becomes, for a given viewing direction,

$$I_b = I_{sky} e^{-\tau_{OD}} + \frac{\bar{\omega}_{OD}}{4\pi} \bar{p}_{OD}(\Theta) F_{s,av} \left(1 - e^{-\tau_{OD}}\right) + \bar{\omega}_{OD} I_{av}^{dif} \left(1 - e^{-\tau_{O\infty}}\right) \quad , \tag{48}$$

and for the intensity in the direction of an object in the planetary boundary layer,

$$I_{obj} = I_o e^{-\tau_R} + \frac{\bar{\omega}_{OD}}{4\pi} \bar{p}_{OD}(\Theta) F_{s,av} \left(1 - e^{-\tau_R}\right) + \bar{\omega}_{OD} I_{av}^{dif} \left(1 - e^{-\tau_R}\right) \quad , \tag{49}$$

where

$\bar{\omega}_{OD}$, $\bar{P}_{OD}(\Theta)$ = the average albedo and phase function, respectively;

τ_{OD} = the optical depth of the path in the boundary layer;

$F_{s,av}$, I_{av}^{dif} = the average solar direct intensity and diffuse intensity, respectively;

I_{sky}, I_o = the intensities from the upper atmosphere and object, respectively.

Thus, the background intensity and the intensity in the direction of an object at distance R from the observer can be computed given the following inputs:

> Background radiative properties (e.g., size distribution, visual range).
> Solar zenith angle.
> Scattering angle.
> Viewed object intensity.
> Direction of observation.
> Planetary boundary layer height.

The plume is treated as a homogeneous layer with a given optical thickness and mean properties $\bar{\omega}_{plume}$ and $\bar{P}_{plume}(\Theta)$. We also assume that the plume does not affect the solar radiation illumination (an optically thin plume).

Diffuse radiation (I_{av}^{dif}) is computed using an approximation discussed in appendix B of Latimer et al. (1978).

Spectral radiance, or light intensity $I(\lambda)$, is calculated for 39 wavelengths spanning the visible spectrum (0.36 μm < λ < 0.74 μm, in 0.01 μm increments).

2.5 GEOMETRY OF PLUME, OBSERVER, AND SUN

For performing as many as four different types of optics calculations at selected points along the plume trajectory, PLUVUE has two modes: plume-based and observer-based calculations. The calculations for plume transport, diffusion, and chemistry are identical for calculations in both modes. The major difference between the two types of calculations is the orientation of the position of the viewer to the source and the plume.

Plume-based calculations are repeated for several combinations of plume-observer-sun geometries. Because of the repetitions, these plume-based calculations are more expensive and produce more printed output than the observer-based calculations, which are performed for only the specific line-of-sight orientations corresponding to the given observer position, the portions of the plume being observed, and the specific position of the sun relative to these lines of sight.

There are four types of optics calculations: (1) horizontal views through the plume with a sky viewing background; (2) nonhorizontal views through the plume with a sky viewing background; (3) horizontal views through the plume with white, gray, and black viewing backgrounds; and (4) horizontal views along the axis of the plume with a sky viewing background.

Figure 7 illustrates the geometry of the plume-based optics calculations for horizontal views through the plume. This figure depicts schematically the variety of distances from the observer to the plume and the variety of horizontal azimuthal angles between the line of sight and the plume trajectory.* Calculations for all these geometries are repeated for up to six different scattering angles.

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* These azimuthal angles are measured from the plume centerline to the line of sight such that the angles range from 0° to 90°.

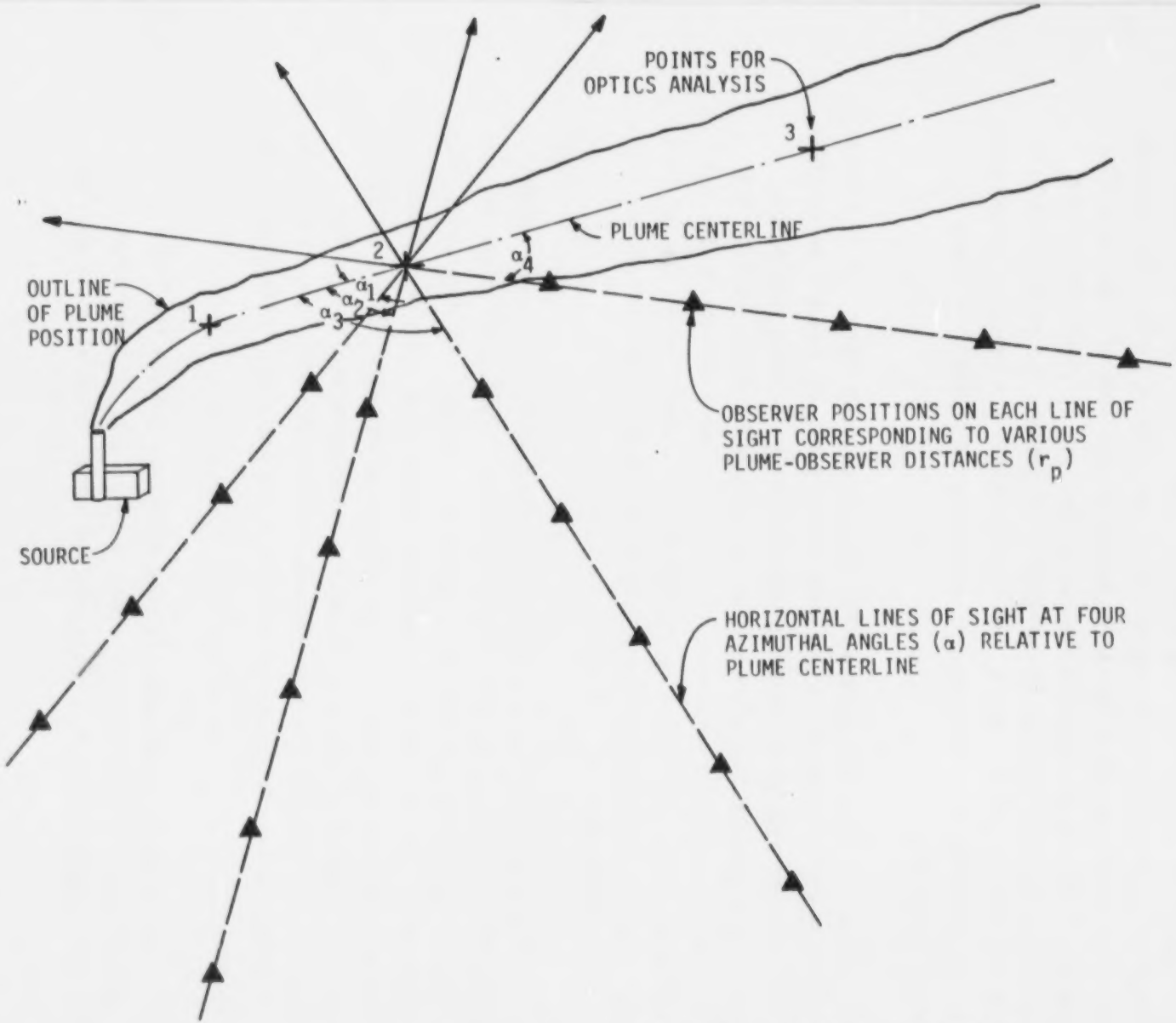


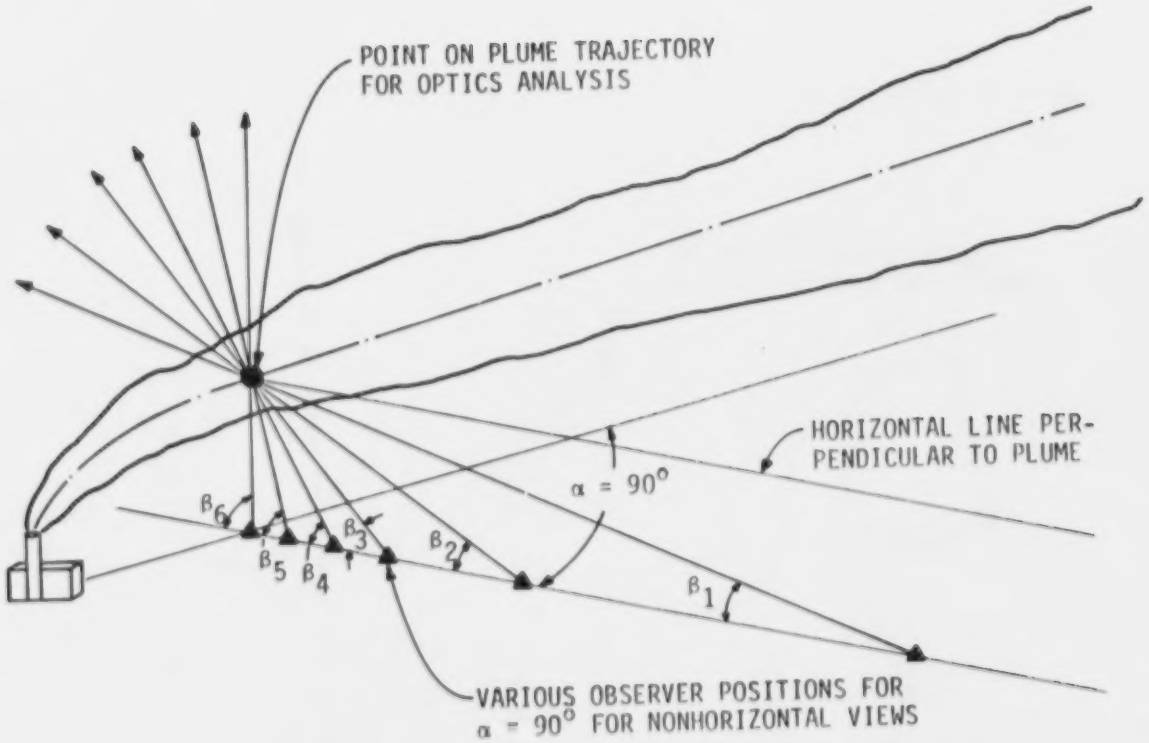
Figure 7. Geometries for plume-based calculations for horizontal views with a sky background.

Plume-based calculations for nonhorizontal views through the plume are shown in figure 8. For one azimuthal angle (α), figure 8(a) shows the range of vertical elevation angles (β) of the line of sight. The observer position is determined by the intersection of the line of sight with flat terrain. For one elevation angle (β) of the line of sight, figure 8(b) shows the range of four azimuthal angles (α) between the plume centerline and the line of sight. Again, these calculations are repeated for as many as six different scattering angles at each point of analysis along the plume trajectory.

Figure 9 shows the geometry for the optics calculation for horizontal views perpendicular to the plume with white, gray, and black viewing backgrounds. For each point on the plume trajectory and each scattering angle, the calculations are executed for a range of distances from the observer to the background object, starting at the plume centerline and ending at 80 percent of the background visual range. The distances, from the observer to the plume, range from 2 percent to 80 percent of the background visual range.

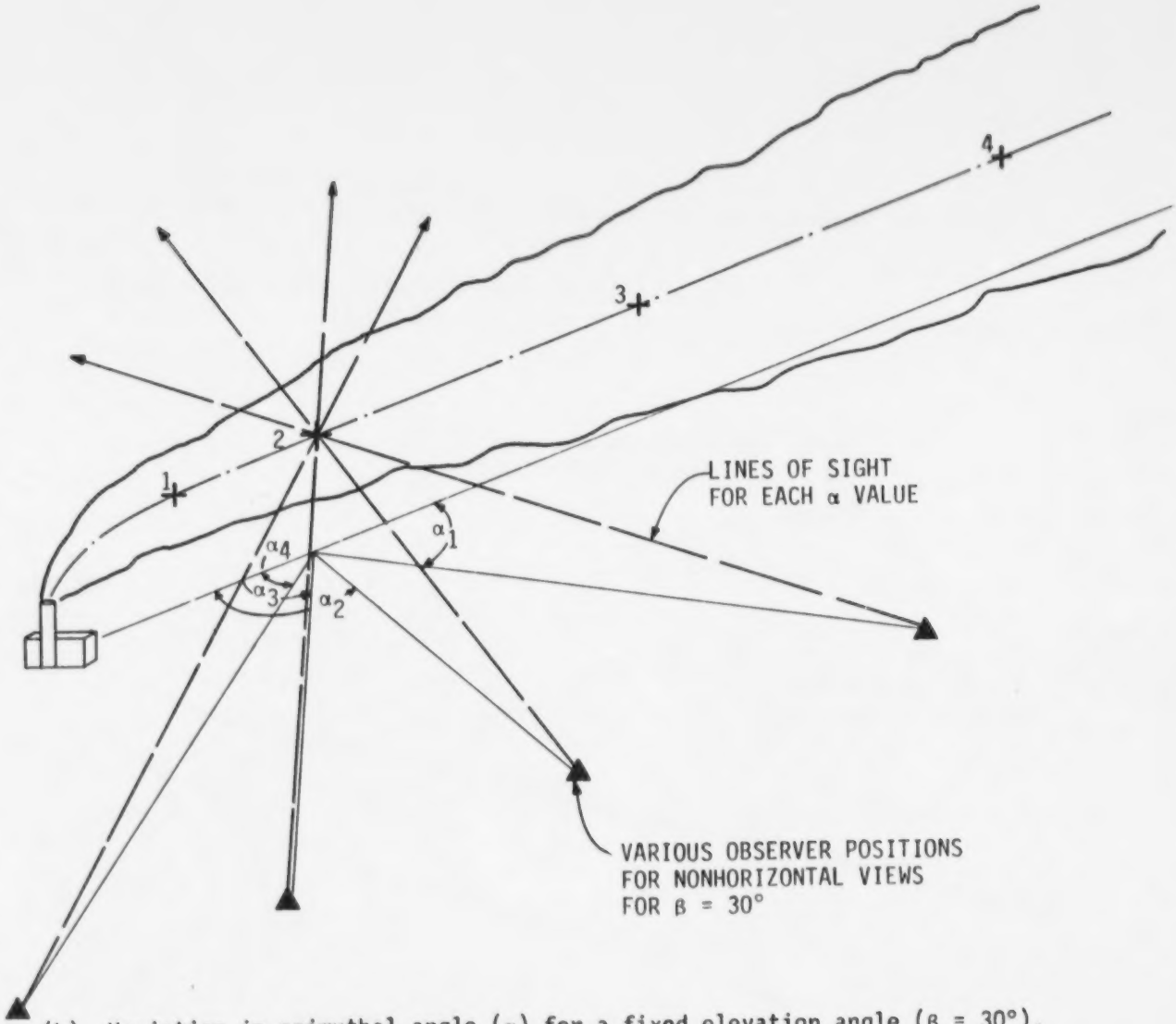
Figure 10 illustrates the configuration used for the plume-based calculation for views along the axis of the plume. The calculations are made from the second through the final downwind distances. At each point, the observer is looking toward the emissions source with a sky background. The calculations are made for views through plume segments defined by the particular point of analysis, as well as successive analysis points upwind. The calculations are repeated for observer positions at a range of distances from the downwind point at which the plume segment is assumed to end.

The observer-based geometry used for views through the plume center with a clear sky background is shown in figure 11. At each point of analysis along the plume trajectory, the optics calculation is made for



(a) Variation in elevation angle (β) for a fixed azimuthal angle (α = 90°) between the plume trajectory and the line of sight.

Figure 8. Geometries for plume-based calculations for nonhorizontal views with a sky background.



(b) Variation in azimuthal angle (α) for a fixed elevation angle (β = 30°).

Figure 8 (concluded).

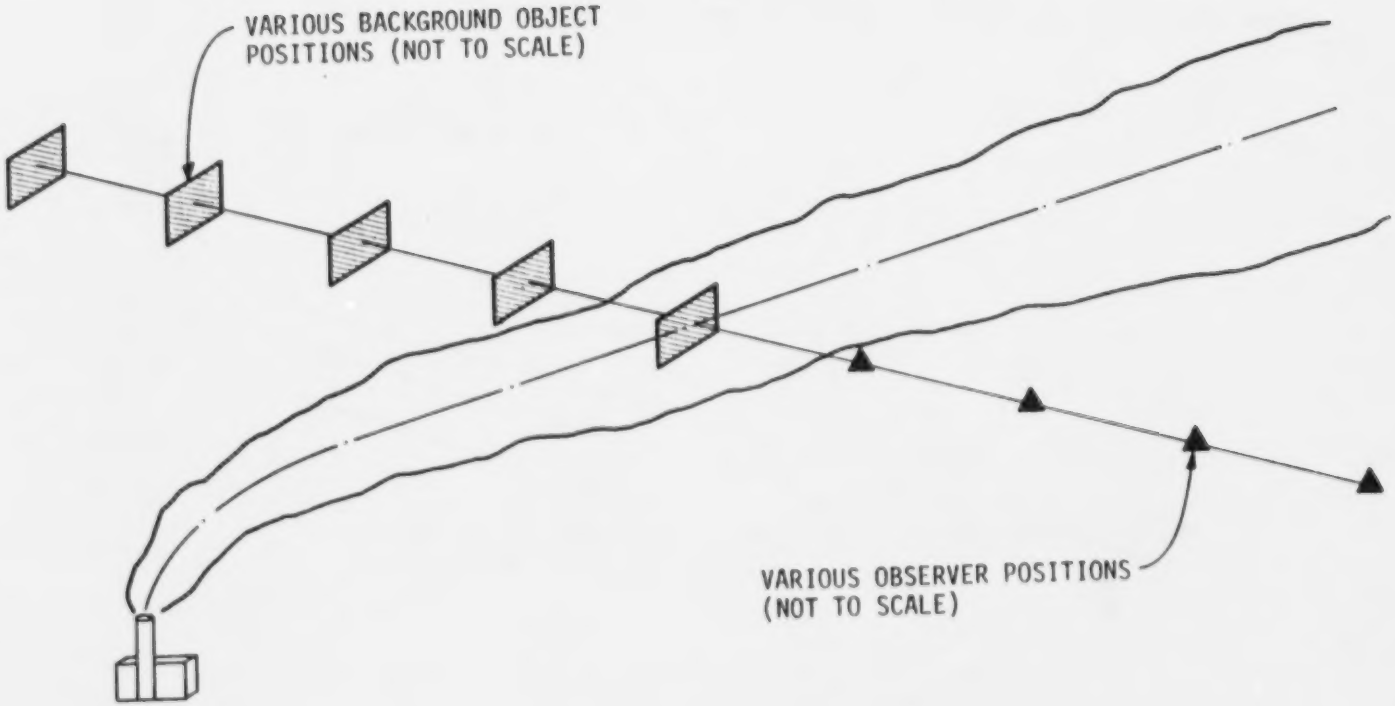


Figure 9. Geometries for plume-based calculations for viewing of white, gray, and black objects for horizontal views perpendicular to the plume.

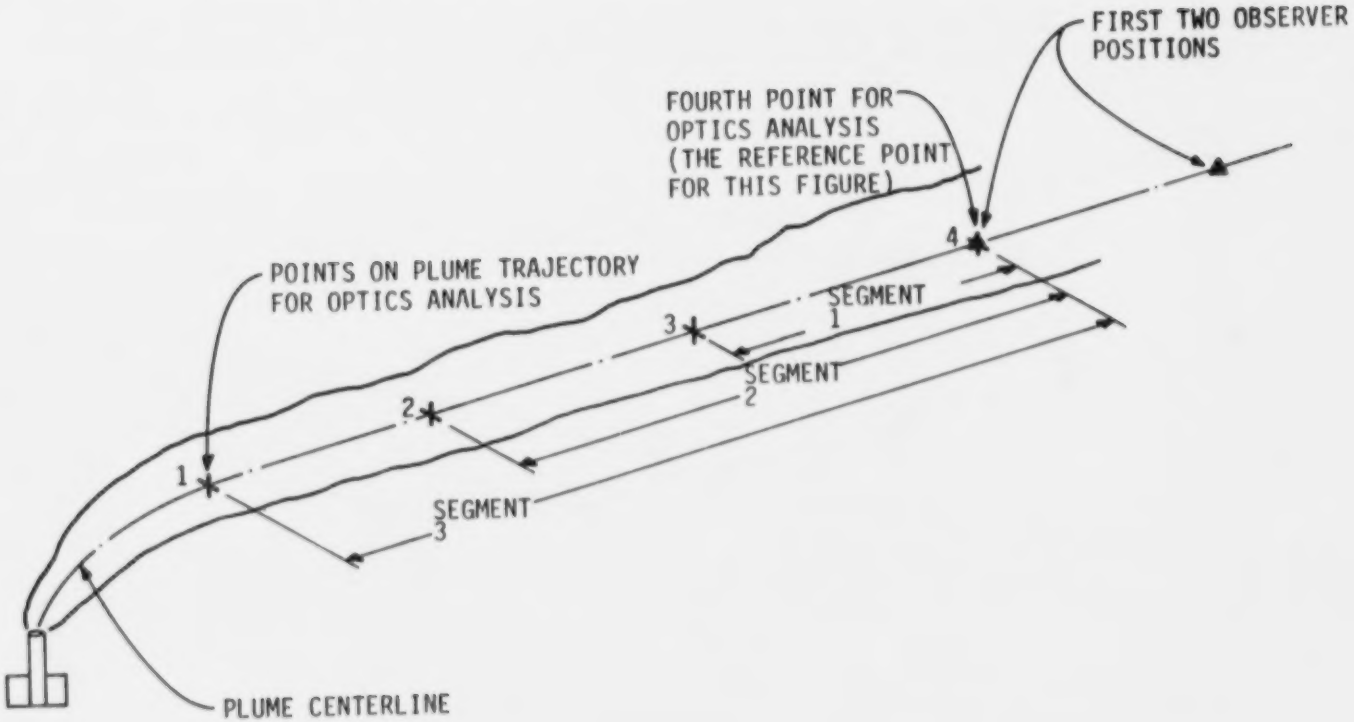


Figure 10. Geometries for plume-based calculations for horizontal views along the axis of the plume.

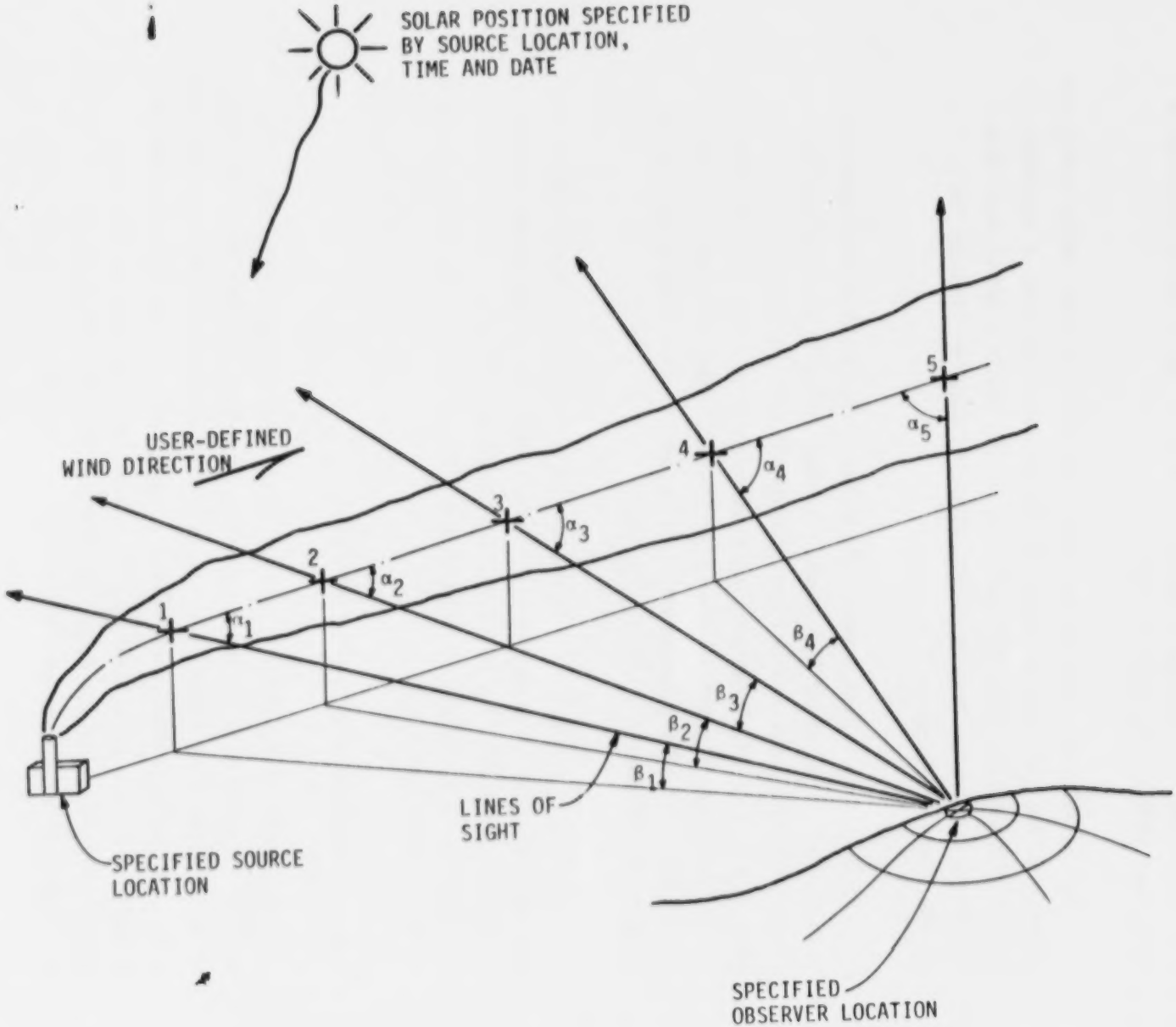


Figure 11. Geometry used for observer-based calculations for nonhorizontal views through the plume for clear-sky backgrounds.

only one scattering angle, one plume-observer distance, and one azimuthal angle specific for the source position, observer position, wind direction, date, and time of day used as input.

For calculations with white, gray, and black viewing backgrounds, the geometries are the same as those for horizontal views with a sky background (figure 11), with the addition of the specific background object distance, along each line of sight, from the observer through the points on the plume trajectory.

Figure 12 is a plan view of the geometry for an observer-based calculation for views along the plume. At each analysis point along the plume trajectory, the centerline concentration is integrated along a segment on the line of sight that would correspond to a Gaussian distribution. The line of sight is always horizontal. The calculation is performed for a clear sky background and for white, gray, and black viewing objects at the specific distance for each line of sight.

It should be noted that if the distance (r_p) and azimuthal angle (α) are such that the observer is within the plume, the total plume optical thickness along the line of sight is reduced accordingly. The calculated distance r_p is the distance between the observer and the centroid of plume material viewed by him.

2.6 QUANTIFYING VISIBILITY IMPAIRMENT

We can quantify visibility impairment once the spectral light intensity or radiance $I(\lambda)$ has been calculated for the specific lines of sight of an observer at a given location in an atmosphere with known aerosol and pollutant concentrations. Visibility impairment--including reduction in visual range, the perceptibility of plumes and haze layers, and atmospheric discoloration--is caused by changes in light intensity as a result of light scattering and absorption in the atmosphere.

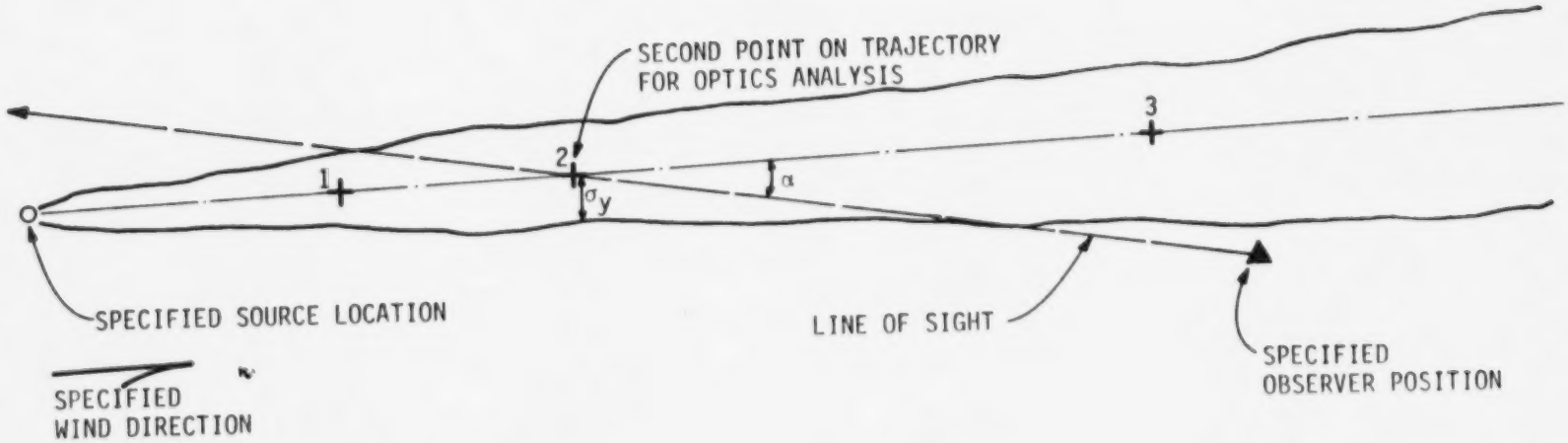


Figure 12. Plan view of geometry for observer-based calculations for views along the plume.

3 PLUVUE INPUT DATA

The input data needed to run PLUVUE are contained in one file of 80 byte, card-image records. These data include the following parameters:

- Wind speed aloft or at the 7-m level.
- Stability category.
- Lapse rate.
- Height of the planetary boundary layer (mixing depth).
- Relative humidity.
- SO_2, NO_x, and particulate emissions rates.
- Flue gas flow rate, exit velocity, and exit temperature.
- Flue gas oxygen content.
- Ambient air temperature at stack height.
- Ambient background NO_x, NO_2, O_3, and SO_2 concentrations.
- Properties (including density, mass median radius, and geometric standard deviation) of background and emitted aerosols in accumulation (0.1-1.0 μm) and coarse (1.0-10.0 μm) size modes.
- Coarse mode background aerosol concentration.
- Background visual range or background sulfate and nitrate concentration.
- Deposition velocities for SO_2, NO_x, coarse mode aerosol, and accumulation mode aerosol.
- UTM coordinates of the source location.
- Elevation of the source location.
- UTM coordinates and elevation of the observer location for an observer-based analysis.
- UTM zone for the site and observer locations.

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- Time, day, month, year, and time zone for the time and date of the simulation.
- For an observer-based run, terrain elevation at the points along the plume trajectory at which the analysis will be performed.
- For an observer-based run with white, gray, and black viewing backgrounds, the distances from the observer to the terrain that will be observed behind the plume.
- For an observer-based run, the wind direction.

The input data file also has numerous switches or flags to allow the user to select the particular subset of the complete model that meets his needs. Table 1 lists the input parameters with formats, summary descriptions, and suggested values for some of the input parameters. The parameter IUSFC is simply a flag to allow the wind speed to be input at the effective stack height (IUSFC = 0) or at the common 7-m instrument height (IUSFC = 1).

IDIS is a flag that selects the desired Gaussian diffusion parameters, which may be Pasquill-Gifford (IDIS = 0), TVA (IDIS = 1), or user-input values (IDIS = 9).

IFLG1 is a flag that allows the user to select or skip the calculation of visibility impairment of the plume for horizontal views with a clear sky background. IFLG2 allows the user to select or skip the calculation of visibility impairment for nonhorizontal views and clear sky background. IFLG3 allows the user to select or skip the calculation of visibility impairment calculations of the plume as seen in front of white, gray, and black backgrounds. IFLG4 allows the user to select or skip the visibility impairment calculation for an observer looking straight down the centerline of various segments of the plume or for an observer looking across the plume at a small acute angle to the plume centerline. For all of these, a value of 1 executes the calculations and a value of 0 branches around them.

TABLE 1. DATA REQUIREMENTS FOR PLUVUE

Card No.	Format	Variables	Description
1	6A4	PLANT	Name of source
2	F5.1	U	Wind speed (mph)
	I5	I	Stability index
	F5.2	ALAPSE	Ambient temperature lapse rate (°F/1000')
3	I2	IUSFC	Index for height for U (=1 for 7m, 0 for effective stack height)
	I2	INEW	Secondary stability index
	I2	NXSTAB	Index for downwind distance where stability changes from I to INEW
4	F10.0	YINITL	Initial plume y-dimension for area source
	F10.0	ZINITL	Initial plume z-dimension for area source
5	F10.1	HPBLM	Mixing depth (m)
6	F10.3	RH	Relative humidity (percent)
7	I5	IDIS	Flag indicating diffusion parameters to be used for stability index I ("1" for TVA, "0" for Pasquill-Gifford-Turner values, "9" for user input values
8	I2	IFLG1	Flag for optics calculation of horizontal views with sky background*
	I2	IFLG2	Flag for optics calculation with nonhorizontal views and sky background*
	I2	IFLG3	Flag for optics calculation for white, gray, and black background*

TABLE 1 (Continued)

Card No.	Format	Variable	Description
	I2	IFLG4	Flag for optics calculation along the plume centerline*
	I2	NX2	Index indicating the number of downwind distances desired (2 < NX2 < 16)
	I2	NT1	Starting index for the scattering angles used in the generic calculation (set to 1 when executing only observer-based calculations)
	I2	NT2	Ending index for the scattering angles used in the plume-based calculation (set to 7 when executing only observer-based calculations)
	I2	NZF	Index for the number of altitudes for visual impact calculations: "1" for plume centerline only, "2" for plume centerline and ground-level downwind
9	I2	IDILU	Switch for printout of table for initial plume rise data
10	8F10.0	DIST(I) I=1, NX2	Downwind distances for visibility impact calculations (2 < NX2 < 16) (2 cards for NX2 > 8)
11	8F10.0	DIST(I)(cont.)	
12	F10.2	QSO2	Total SO_2 emissions rate from all stacks in tons per day
	F10.2	QNOX	Total NO_x emissions rate from all stacks in tons per day

TABLE 1 (Continued)

Card No.	Format	Variables	Description
	F10.2	QPART	Total primary particulate emissions rates from all stacks in tons per day
13	F10.1	FLOW	Flue gas flow rate (cfm) per stack
	F10.1	FGTEMP	Flue gas exit temperature (°F)
	F10.1	FGO2	Flue gas oxygen concentration (mole percent) [3][§]
	F10.2	WMAX	Flue gas stack exit velocity (m/s)
14	F5.1	UNITS	Number of stacks
	F5.1	HSTACK	Stack height (feet)
15	F10.1	TAMB	Ambient temperature (°F)
16	F10.3	AMBNOX	Ambient [NO_x] in ppm [0]
	F10.3	AMBNO2	Ambient [NO_2] in ppm [0]
	F10.3	O3AMB	Ambient [O_3] in ppm [0.04]
	F10.3	AMBSO2	Ambient [SO_2] in ppm [0]
17	F10.3	ROVA	Mass median radius (μm) for background accumulation mode aerosol [0.16]
	F10.3	ROVC	Mass median radius (μm) for background coarse mode aerosol [3.0]
	F10.3	ROVS	Mass median radius (μm) for plume secondary aerosol [0.10]
	F10.3	ROVP	Mass median radius (μm) of emitted primary particulate [1.0]

TABLE 1 (Continued)

Card No.	Format	Variables	Description
18	F10.3	SIGA	Geometric standard deviation of background accumulation mode aerosol radius [2.0]
	F10.3	SIGC	Geometric standard deviation of background coarse mode aerosol radius [2.2]
	F10.3	SIGS	Geometric standard deviation of plume secondary aerosol radius [2.0]
	F10.3	SIGP	Geometric standard deviation of plume primary aerosol radius [2.0]
19	F10.3	DENA	Particle density (g/cm^3) of background accumulation mode aerosol [1.5]
	F10.3	DENC	Particle density (g/cm^3) of background coarse mode aerosol [2.5]
	F10.3	DENS	Particle density (g/cm^3) of plume secondary aerosol [1.5]
	F10.3	DENP	Particle density (g/cm^3) of emitted primary particulate [2.5]
20	F10.3	CORAMB	Ambient coarse mode aerosol concentration ($\mu g/m^3$)
21	I5	INTYP	Switch for next card (=1 for $AMBSO_4$ and $AMBNO_3$, ≠ 1 for RVAMB)
22a (INTYP=1)	F10.3	AMBSO4	Ambient background sulfate mass concentration ($\mu g/m^3$)
	F10.3	AMBNO3	Ambient background nitrate mass concentration ($\mu g/m^3$)

TABLE 1 (Continued)

Card No.	Format	Variables	Description
22b (INTYP ≠ 1)	F10.3	RVAMB	Ambient background visual range (km)
23	F5.2	VDSO2	SO_2 deposition velocity (cm/sec) [1]
	F5.2	VDNOX	NO_x deposition velocity (cm/sec) [1]
	F5.2	VDCOR	Coarse mode aerosol deposition velocity (cm/sec) [0.1]
	F5.2	VDSUB	Accumulation mode aerosol deposition velocity (cm/sec) [0.1]
24	I5	ICON	Index for SO_2-to-$SO_4^=$ conversion rate added to rate predicted from OH• chemistry. ICON = 0 for conversion rate, set constant with distance from source. ICON = 1 for separate values for each point of analysis downwind of the source [0]
25	F10.7	RSO2C	Rate constant for SO_2-to-$SO_4^=$ conversion to be added to prediction from OH• chemistry (%/hr) [0.0]
A-1† (If ICON = 1)	8F10.7	RSO2(NX), NX=1,8	SO_2-to-$SO_4^=$ conversion rates to be added to predictions from OH• chemistry at each point of analysis on plume (%/hr)
A-2† (continuation of A-1)	8F10.7	RSO2(NX), NX=9,NX2	(Continuation as needed)
26	I5	NC1	Index to control type of calculations. NC1=1 for plume-based calculations, 2 for observer based calculations only

TABLE 1 (Continued)

Card No.	Format	Variable	Description
	I5	NC2	Index to control calculations NC2=1 for plume-based calculations only, 2 for observer-based calculations
A-3† (If NC1=1)	6I2	NPP	Indexes for controlling the subset of results (from plume-based calculations of horizontal views with sky, white, gray, and black backgrounds) to be written to a file for later use by the VISPLOT program for generating plots. NPP controls the distance from the observer to the plume for sky background [3]
		NAP	Index for selecting the horizontal azimuthal angle α between the line of sight and the plume trajectory for plots of results for sky backgrounds [4]
		NTP	Index for selecting the scattering angle of plume-based data to be plotted
		NZP	Index for selecting the level of the line of sight through the plume for plume-based data to be plotted [3]
		IO1P	Index for selecting the distance from the observer to the background object for the plume-based data to be plotted
		IPP	Index for selecting the distance from the observer to the plume for plume-based plot data with background object views

TABLE 1 (Continued)

Card No.	Format	Variables	Description
A-3† (If NC2=2)	F10.1	XOBS	UTM x-coordinate of observer position (in km) for observer-based calculations
	F10.1	YOBS	UTM y-coordinate of observer position (km)
	F10.1	ZOBS	Elevation (feet msl) of observer position
27	F10.1	XSTACK	UTM x-coordinate of source (km)
	F10.1	YSTACK	UTM y-coordinate of source (km)
	F10.1	ZSTACK	Elevation of source location (ft. MSL)
28	I5	IZONE	UTM grid zone number within which source is located
	I5	IMO	Number of month for date of simulation
	I5	IDAY	Day of month for date of simulation
	F5.0	TIME	Time of day (24-hr clock)
	F5.0	TZONE	Time zone number
	I5	IYEAR	Year for date of simulation
A-4† (If NC2=2)	8F10.1	TER(NX), NX=1,8	Elevation of terrain at the selected points downwind of the source along the plume trajectory (ft. MSL) (for observer-based calculation)
A-5† (If NC2=2)	8F10.1	TER (NX), NX=9, NX2	(Continuation as needed)
A-6† (If NC2=2)	8F10.1	ROBJCT(NAZ), NAZ=1,8	Distances in kilometers from observer to background terrain for observer azimuths of 15°, 30°, 45°, 60°, 75°, 90°, 105°, 120°

TABLE 1 (Concluded)

Card No.	Format	Variable	Description
A-7† (continuation of A-4)	8F10.1	ROBJCT(NAZ), NAZ=9,16	Distances for azimuths of 135°, 150°, 165°, 180°, 195°, 210°, 225°, 240°
A-8† (continuation of A-5)	8F10.1	ROBJCT(NAZ), NAZ=17,24	Distances for azimuths of 255°, 270°, 285°, 300°, 315°, 330°, 345°, 360°
A-9† (If NC2=2)	F10.1	WIND	Wind direction azimuth (degrees from North)
A-10† (If IDIS=9)	F5.1	SY	Dispersion parameters in meters,
(to A-10† + NX2)	F5.1	SZ	one card for each distance

* "0" if table is not desired, "1" if desired.

† "A-n" refers to cards that are optional. They are inserted only when values of prior flags or indexes are set to require additional input data, e.g., when ICON=1, cards A-1 and A-2 are required.

§ Suggested values for some of the input parameters are shown in brackets.

NZF is a switch that indicates whether the visibility impairment calculations will be made for the plume centerline altitude only (NZF = 1) or for both the plume centerline and ground level (NZF = 2).

IDILU is a switch that controls the printing of the table of initial plume rise data. If IDILU = 0, the table is not printed, and if IDILU =1, it is printed.

INTYP is a switch that allows the user to calculate the background visual range (INTYP = 1) from user-input background coarse mode aerosol concentrations and background sulfate and nitrate concentrations. If INTYP ≠ 1, the user inputs the background visual range and the background coarse mode aerosol concentration, and the model computes the background accumulation mode aerosol concentration that would be needed to cause the given visual range.

ICON is a switch that allows the user to select the conversion rate of SO_2 to $SO_4^=$, in addition to the rate calculated by the OH• model, as a constant with distance from the source (ICON = 0) or as a separate value for each point of analysis downwind from the source (ICON = 1). These conversion rates are in units of percent per hour. RSO2C gives the constant conversion rate for all points on the plume trajectory, while RSO2 gives the downwind-distance-dependent conversion rates for each point of analysis.

The parameters NC1 and NC2 are used to control whether the visibility impairment calculations are done for a plume-based scheme, an observer-based scheme, or both. NC1 set to 1 executes the plume-based calculations and NC2 set to 2 calculates the observer-based calculations. If NC1 is set to 1 and NC2 is set to 2, both types of calculations will be made. If NC1 is set to 1 and NC2 is set to 1, only the plume-based calculations will be made. Finally, if NC1 is set to 2 and NC2 is set to 2, only the observer-based calculations will be made.

The stability index I specifies the stability category for the plume dispersion parameters: I = 1 for stability A, I = 2 for stability B, I = 3 for stability C, etc. INEW and NXSTAB allow for a stability change at some point downwind along the plume trajectory. INEW is the new stability and NXSTAB is the index of the element of downwind distance array where the stability changes. If no stability change is desired, simply set INEW to I and NXSTAB to the value of NX2 plus one.

NT1 and NT2 assign the starting and ending indexes for the scattering angle array used for the plume-based visibility impairment calculations. With NT1 = 1 and NT2 = 7, the default scattering angles (22°, 45°, 90°, 135°, 158°, and 180°) are used. These angles are taken from the array TT, which has 0°, 22°, 45°, 90°, 135°, 158°, and 180° as its first seven elements. NT1 is one less than the actual starting index of TT, while NT2 corresponds to the actual ending index of TT. For a run with calculations for 90° only, NT1 is set to 3 and NT2 is set to 4. For a run with calculations for 90°, 135°, 158°, and 180°, NT1 is set to 3 and NT2 is set to 7.

The index NX2 defines the number of points downwind along the plume trajectory where visibility impairment calculations will be made. The value of NX2 should be at least 2 and not greater than 16.

The array DIST specifies the distance downwind from the source along the plume trajectory of each point where visibility impairment calculations will be made. The units for this array are kilometers. It is important, for accurate prediction of the oxidation of NO_x to NO_2, to use downwind distances that are close together and near the source. The first downwind distance must be 1 km; 2.5 km, 5 km, and 10 km are recommended for the succeeding three distances. The user is free to select the remaining points according to the needs of the situation.

YINITL and ZINITL are used for area sources and define the initial lateral and vertical dimensions of the plume. For emissions from stacks, both YINITL and ZINITL should be set to zero. The units for these two variables are meters.

When plume-based calculations are complete, a subset of the results must be selected for plotting with the program VISPLOT (appendix C). VISPLOT is designed to plot the visibility impairment parameters from the calculations for horizontal views with a sky background and for horizontal views with white, gray, and black object backgrounds. The 6 indexes listed on card A-3 determine the subset of results that will be written to logical file unit eight. NPP selects the distance from the observer to the plume in the following manner:

NPP	Distance from Observer to Plume (fraction of background visual range)
1	0.02
2	0.05
3	0.10
4	0.20
5	0.50
6	0.80

NAP determines the horizontal azimuthal angle alpha between the plume centerline and the line of sight for a sky background:

NAP	Alpha (degrees)
1	30°
2	45°
3	60°
4	90°

NTP selects the scattering angle between the direct solar beam and the line of sight from the point of analysis to the observer. The value of NTP must be greater than or equal to NT1 and less than or equal to (NT2-1). The values of NTP for each of the six scattering angles are shown below:

NTP	Scattering Angle (degrees)
1	22°
2	45°
3	90°
4	135°
5	158°
6	180°

NZP selects the results for calculations of views through the center of the plume or views at ground level across the plume trajectory. The values of NZP are limited by the value of NZF (card no. 8). If NZF = 1, the calculations are done only for views through the plume centerline, and NZP must be set to 3. If NZF = 2, NZP may be set to 3 for values from calculations for views through the plume centerline, or NZP may be set to 6 for values from calculations for views at the surface through the plume trajectory. The index IPP selects the distance from the observer to the plume for plotting results of the calculations for views with white, gray, and black objects behind the plume. The values of IPP correspond to the distances shown below:

IPP	Distance from Observer to Plume (fraction of background visual range)
1	0.02
2	0.05
3	0.10
4	0.20
5	0.50
6	0.80

IO1P is used to select the distance from the observer through the plume to the white, gray, and black background objects behind the plume. The value of IO1P is limited by the value of IPP because the object background can be no farther than a distance equivalent to 80 percent of the background visual range from the observer. If IPP = 1, the range of values of IO1P is shown below:

IO1P	Distance from Observer to Object (fraction of background visual range)
1	0.02
2	0.05
3	0.10
4	0.20
5	0.50
6	0.80

When IPP = 2, the values IO1P available are as follows:

IO1P	Distance from Observer to Object
1	0.05
2	0.10
3	0.20
4	0.50
5	0.80

When IPP = 3, IO1P is limited to one of the following values:

IO1P	Distance
1	0.10
2	0.20
3	0.50
4	0.80

When IPP = 4, IO1P is limited to these three values:

IO1P	Distance
1	0.20
2	0.50
3	0.80

When IPP = 5, IO1P is limited to only two values:

IO1P	Distance
1	0.50
2	0.80

When IPP = 6, IO1P must be set to 1, which corresponds to a distance from the observer to the background object of 0.80 of the background visual range. These six indexes do not place any restrictions on the calculations made by PLUVUE, but they provide a means of selecting the desired subset of results to be saved for plotting.

The UTM coordinates and elevations for observer and source locations and the UTM grid zone numbers are taken from standard USGS maps. TZONE is the number of the time zone, with the Greenwich Meridian defined as 0. Values of TZONE are shown below:

Time Zone	Standard Time	Daylight Time
Eastern	5	4
Central	6	5
Mountain	7	6
Pacific	8	7

The array TER gives the elevation of terrain at each point downwind for the visibility analysis. For the purpose of calculating plume-observer-sun geometry only, the plume centerline is assumed to rise above any terrain higher than the source elevation in order to maintain the same effective height above the terrain for all points downwind. If the terrain is flat or if it is desirable to maintain the same plume elevation at all points, use zero for all TER values. The model will then set all terrain elevations to the elevation of the source location.

The ROBJT array allows the user to define the distances from the observer to the background terrain. These distances are read in for observer azimuths of from 15° to 360° in 15° increments. The distances are measured in kilometers by creating a terrain profile for each azimuth and determining the point at which the line of sight intersects the terrain. The observer-based calculations can be performed without measuring these values by setting all elements of the ROBJT array to zero. The background object distance will then be set to the observer-to-plume distance for each line of sight. WIND is the direction from which the wind is blowing, expressed in degrees.

For user-defined values of plume dispersion parameters (IDIS = 9), SY and SZ are read for each downwind distance. SY is the plume concentration horizontal standard deviation and SZ is the plume concentration vertical standard deviation in meters.

4 PLUVUE OUTPUT

A PLUVUE run will write results on three files: the print file on logical file unit six, the observer-based perceptibility data for plotting on logical file unit seven, and the plume-based plot data on logical file unit eight. If a PLUVUE run is for either observer-based or plume-based calculations, either an observer-based or a plume-based plot file will be created.

The principal PLUVUE run output is the print file written on logical unit six. The file size depends on the number and type of calculations invoked by the input file. All runs have the data tables for the emissions source, meteorological and ambient air quality, and background radiative transfer. The following discussion describes the output of each table.

The emissions source data table verifies to the user that the input data were read correctly by the model. The descriptions in the printed output adequately describe the parameters. See the example in exhibit 1.

Exhibit 2 is an example of the table of meteorological and ambient air quality data. Almost all the data provides the user with more input verification, except for the background sulfate and nitrate concentrations, which are calculated by the model to match the input values of background visual range and the ambient coarse mode aerosol concentration. If the background sulfate and nitrate concentrations are the input, the model will calculate the background visual range and print its value in this table. Following the table for meteorological and air quality data, the table on aerosol statistics simply prints the user-defined values for aerosol size distribution and density.

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VISUAL IMPACT ASSESSMENT FOR 1600 MW POWER PLANT
    EMISSIONS SOURCE DATA
        ELEVATION OF SITE =          5650.   FEET MSL
                                     1722.   METERS MSL
        NO. OF UNITS =     4.
        STACK HEIGHT =   600.   FEET
                         183.   METERS
        FLUE GAS FLOW RATE =     1555980.   CU FT/MIN
                                   734.23   CU M/SEC
        FLUE GAS TEMPERATURE =          138.   F
                                        332.   K
        FLUE GAS OXYGEN CONTENT =          3.0   MOL PERCENT
        SO2 EMISSION RATE (TOTAL) =       37.50   TONS/DAY
                                       3.937E 02   G/SEC
        NOX EMISSION RATE (TOTAL,AS NO2) =      131.80   TONS/DAY
                                             1.384E 03   G/SEC
        PARTICULATE EMISSION RATE (TOTAL) =        4.90   TONS/DAY
                                             5.145E 01   G/SEC
```

Exhibit 1. Emissions source data table.

METEOROLOGICAL AND AMBIENT AIR QUALITY DATA

WINDSPEED = 4.5 MILES/HR
2.0 M/SEC

PASQUILL-GIFFORD-TURNER STABILITY CATEGORY E
LAPSE RATE = 0.00 F/1000 FT
0.003E-01 K/M

POTENTIAL TEMPERATURE LAPSE RATE = 9.800E-03 K/M
AMBIENT TEMPERATURE = 45.0 F
280.4 K

RELATIVE HUMIDITY = 45.0 %
MIXING DEPTH = 1000. M
AMBIENT PRESSURE = 0.82 ATM
BACKGROUND NOX CONCENTRATION = 0.000 PPM
BACKGROUND NO2 CONCENTRATION = 0.000 PPM
BACKGROUND OZONE CONCENTRATION = 0.038 PPM
BACKGROUND SO2 CONCENTRATION = 0.000 PPM
BACKGROUND COARSE MODE CONCENTRATION = 10.0 UG/M3
BACKGROUND SULFATE CONCENTRATION = 2.9 UG/M3
BACKGROUND NITRATE CONCENTRATION = 0.0 UG/M3
BACKGROUND VISUAL RANGE = 185.0 KILOMETERS
SO2 DEPOSITION VELOCITY = 1.00 CM/SEC
NOX DEPOSITION VELOCITY = 1.00 CM/SEC
COARSE PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC
SUBMICRON PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC

AEROSOL STATISTICS

	BACKGROUND		PLUME	
MASS MEDIAN RADIUS MICROMETERS	ACCUMULATION MODE 0.125	COARSE MODE 2.750	ACCUMULATION MODE 0.125	COARSE MODE 0.850
GEOMETRIC STANDARD DEVIATION	2.200	2.200	1.500	1.500
PARTICLE DENSITY G/(CM**3)	1.800	2.000	1.800	2.000

Exhibit 2. Meteorological and ambient air quality data.

Exhibit 3 presents the table for observer-based calculations, showing the observer-plume geometry for each downwind distance along the plume. The titles are defined in the glossary.

Exhibit 4 is the table of background conditions. The mass median radius, geometric standard deviation, and the calculated value of b_{scat}/M at 0.55 mm are given for the background accumulation mode aerosol, background coarse mode aerosol, and the plume primary aerosol. Refer to the glossary for a detailed explanation.

Although the detailed table of information on the initial plume dilution and nitrogen dioxide formation is not printed by default, the user may obtain this table by changing the input flag from the default value. Exhibit 5 is an example. The results are printed for ten-second time intervals from the time of emission. Definitions of the titles may be found in the glossary. The plume rise above the source elevation at 1 km downwind is maintained for any terrain elevation farther downwind at points along the plume trajectory.

Exhibit 6 shows plume concentrations calculated for each downwind distance selected by the user. The SO_2-to-$SO_4^=$ and NO_x-to-NO_3^- conversion rates are those predicted by the OH• chemical model. The concentrations of the various species and the mass concentration ratios are indicated at the top of the table; the increment above background and total are listed for the six altitudes, reading from top to bottom. The altitudes are at the plume centerline, ground level, $\pm 1\ \sigma_z$, and $\pm 2\ \sigma_z$ concentration vertical standard deviations, as shown in figure 13. NTOT is the total nitrogen mass concentration, STOT is the total sulfur mass concentration, PRIMARY is the plume primary particulate, and BSP-TOTAL is the sum of the scattering coefficients for the plume primary particulate and sulfate aerosol. BSPS/BSP is the ratio of the total sulfate to the total (sulfate plus primary particulate) aerosol scattering coefficient for the plume. At the bottom of this table, the cumulative surface deposition of SO_2, NO_x, $SO_4^=$, and NO_3^- are given in terms of the mole fraction of initial flux. NO_x is used for initial flux of NO_3^- and SO_2 is used for initial flux of SO .

GEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIENTATION
WIND DIRECTION (DEGREES) = 11.3
SIMULATION IS FOR 900. HOURS ON 9/21
SOLAR ZENITH ANGLE (DEGREES) = 51.0
SOLAR AZIMUTH ANGLE (DEGREES) = 51.0
GEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELS AT GIVEN DOWNWIND DISTANCES (X)

X (KM)	AZIMUTH	RP	ALPHA	BETA	THETA
1.0	19.6	87.6	8.3	-0.0	48.4
2.0	19.7	86.8	8.4	-0.0	48.4
5.0	20.0	83.8	8.7	0.0	48.2
10.0	20.5	78.9	9.2	0.0	47.9
20.0	21.8	69.0	10.5	0.1	47.2
40.0	26.1	49.3	14.8	0.1	45.1
60.0	35.7	30.6	24.4	0.1	41.3
80.0	69.3	14.9	58.0	0.2	42.3
100.0	145.1	17.5	46.2	0.1	93.2
120.0	169.8	34.5	21.5	0.4	111.8
140.0	177.7	53.6	13.6	0.3	117.5
160.0	181.4	73.2	9.9	-0.0	120.3
180.0	183.5	93.0	7.8	0.1	121.6
200.0	184.9	112.8	6.4	0.2	122.5
220.0	185.8	132.7	5.5	0.1	123.2
240.0	186.6	152.6	4.7	-0.0	123.7

Exhibit 3. Observer-plume-sun geometry for observer-based calculations.

BACKGROUND CONDITIONS

ACCUMULATION MODE			COARSE PARTICLE MODE			PRIMARY PARTICLE MODE		
MASS RADIUS	SIGMA	BSCAT.55/MASS	MASS RADIUS	SIGMA	BSCAT.55/MASS	MASS RADIUS	SIGMA	BSCAT.55/MASS
0.1250E 00	0.2200E 01	0.2344E-02	0.2750E 01	0.2200E 01	0.4469E-03	0.8500E 00	0.1500E 01	0.1242E-02

COEFFICIENTS AT 0.55 MICROMETERS , 1./KM

BTARAY =0.9747E-02 BTAAER =0.1202E-01 ABSB02 =0.0000E 00 BTABAC =0.2115E-01

Exhibit 4. Background scattering and extinction coefficients.

INITIAL PLUME RISE AND DILUTION AND NITROGEN DIOXIDE FORMATION
1600 MW POWER PLANT

TIME (SEC)	X (M)	DELTA H (M)	U (M/S)	W (M/S)	V (M/S)	SIGMA (M)	TEMP (K)	O2 MOL P	NO2-NO EQUIL	RATIO ACTUAL	NOX (PPM)	NO (PPM)	NO2T (PPM)	SO2 (PPM)	PARTICULATE UG/M3
0.	0.0	0.0	2.01	17.50	17.50	0.0	332.0	3.0	5.9E 04	4.2E-03	340.166	338.750	1.416	69.579	2.38E 04
10.	20.1	31.6	2.01	0.70	2.13	15.8	290.3	17.5	9.4E 05	6.2E-03	65.375	64.974	0.401	13.372	4.57E 03
20.	40.2	50.2	2.01	0.57	2.09	25.1	284.3	19.6	1.3E 06	9.0E-03	25.906	25.676	0.230	5.299	1.81E 03
30.	60.3	65.7	2.01	0.50	2.07	32.9	282.7	20.1	1.4E 06	1.0E-02	15.128	14.975	0.154	3.094	1.06E 03
40.	80.5	79.6	2.01	0.45	2.06	39.8	281.9	20.4	1.5E 06	1.1E-02	10.333	10.220	0.113	2.114	7.23E 02
50.	100.6	92.4	2.01	0.42	2.06	46.2	281.5	20.5	1.5E 06	1.2E-02	7.688	7.600	0.088	1.573	5.38E 02
60.	120.7	104.3	2.01	0.40	2.05	52.2	281.3	20.6	1.5E 06	1.2E-02	6.038	5.966	0.071	1.235	4.22E 02
70.	140.8	115.6	2.01	0.38	2.05	57.8	281.1	20.7	1.5E 06	1.2E-02	4.922	4.862	0.060	1.007	3.44E 02
80.	160.9	126.4	2.01	0.36	2.04	63.2	281.0	20.7	1.6E 06	1.3E-02	4.123	4.072	0.051	0.843	2.88E 02
90.	181.0	136.7	2.01	0.35	2.04	68.4	280.9	20.8	1.6E 06	1.3E-02	3.527	3.483	0.045	0.721	2.47E 02
100.	201.1	146.7	2.01	0.34	2.04	73.3	280.8	20.8	1.6E 06	1.3E-02	3.067	3.028	0.039	0.627	2.15E 02
110.	221.3	147.1	2.01	0.33	2.04	73.5	280.8	20.8	1.6E 06	1.3E-02	3.053	3.013	0.040	0.624	2.14E 02
120.	241.4	147.1	2.01	0.32	2.04	73.5	280.8	20.8	1.6E 06	1.3E-02	3.055	3.015	0.040	0.625	2.14E 02
130.	261.5	147.1	2.01	0.31	2.03	73.5	280.8	20.8	1.6E 06	1.3E-02	3.057	3.017	0.041	0.625	2.14E 02
140.	281.6	147.1	2.01	0.30	2.03	73.5	280.8	20.8	1.6E 06	1.4E-02	3.059	3.018	0.041	0.626	2.14E 02
150.	301.7	147.1	2.01	0.29	2.03	73.5	280.8	20.8	1.6E 06	1.4E-02	3.060	3.019	0.042	0.626	2.14E 02
160.	321.8	147.1	2.01	0.29	2.03	73.5	280.8	20.8	1.6E 06	1.4E-02	3.062	3.020	0.042	0.626	2.14E 02
170.	342.0	147.1	2.01	0.28	2.03	73.5	280.8	20.8	1.6E 06	1.4E-02	3.063	3.020	0.043	0.626	2.14E 02
180.	362.1	147.1	2.01	0.28	2.03	73.5	280.8	20.8	1.6E 06	1.4E-02	3.064	3.021	0.043	0.627	2.14E 02
190.	382.2	147.1	2.01	0.27	2.03	73.5	280.8	20.8	1.6E 06	1.4E-02	3.065	3.021	0.044	0.627	2.14E 02
200.	402.3	147.1	2.01	0.27	2.03	73.5	280.8	20.8	1.6E 06	1.5E-02	3.066	3.022	0.044	0.627	2.14E 02
210.	422.4	147.1	2.01	0.26	2.03	73.5	280.8	20.8	1.6E 06	1.5E-02	3.067	3.022	0.045	0.627	2.15E 02
220.	442.5	147.1	2.01	0.26	2.03	73.5	280.8	20.8	1.6E 06	1.5E-02	3.068	3.022	0.045	0.627	2.15E 02
230.	462.6	147.1	2.01	0.25	2.03	73.5	280.8	20.8	1.6E 06	1.5E-02	3.068	3.023	0.046	0.628	2.15E 02
240.	482.8	147.1	2.01	0.25	2.03	73.5	280.8	20.8	1.6E 06	1.5E-02	3.069	3.023	0.046	0.628	2.15E 02
250.	502.9	147.1	2.01	0.25	2.03	73.5	280.8	20.8	1.6E 06	1.5E-02	3.070	3.023	0.047	0.628	2.15E 02
260.	523.0	147.1	2.01	0.24	2.03	73.5	280.8	20.8	1.6E 06	1.6E-02	3.070	3.023	0.047	0.628	2.15E 02
270.	543.1	147.1	2.01	0.24	2.03	73.5	280.8	20.8	1.6E 06	1.6E-02	3.071	3.023	0.048	0.628	2.15E 02
280.	563.2	147.1	2.01	0.24	2.03	73.5	280.8	20.8	1.6E 06	1.6E-02	3.071	3.023	0.048	0.628	2.15E 02
290.	583.3	147.1	2.01	0.24	2.03	73.5	280.8	20.8	1.6E 06	1.6E-02	3.072	3.023	0.049	0.628	2.15E 02
300.	603.4	147.1	2.01	0.23	2.02	73.5	280.8	20.8	1.6E 06	1.6E-02	3.072	3.023	0.049	0.628	2.15E 02
310.	623.6	147.1	2.01	0.23	2.02	73.5	280.8	20.8	1.6E 06	1.6E-02	3.073	3.023	0.050	0.628	2.15E 02
320.	643.7	147.1	2.01	0.23	2.02	73.5	280.8	20.8	1.6E 06	1.7E-02	3.073	3.023	0.050	0.629	2.15E 02
330.	663.8	147.1	2.01	0.23	2.02	73.5	280.8	20.8	1.6E 06	1.7E-02	3.073	3.023	0.051	0.629	2.15E 02
340.	683.9	147.1	2.01	0.22	2.02	73.5	280.8	20.8	1.6E 06	1.7E-02	3.074	3.023	0.051	0.629	2.15E 02
350.	704.0	147.1	2.01	0.22	2.02	73.5	280.8	20.8	1.6E 06	1.7E-02	3.074	3.023	0.052	0.629	2.15E 02
360.	724.1	147.1	2.01	0.22	2.02	73.5	280.8	20.8	1.6E 06	1.7E-02	3.075	3.022	0.052	0.629	2.15E 02
370.	744.3	147.1	2.01	0.22	2.02	73.5	280.8	20.8	1.6E 06	1.7E-02	3.075	3.022	0.053	0.629	2.15E 02
380.	764.4	147.1	2.01	0.22	2.02	73.5	280.8	20.8	1.6E 06	1.8E-02	3.075	3.022	0.053	0.629	2.15E 02
390.	784.5	147.1	2.01	0.21	2.02	73.5	280.8	20.8	1.6E 06	1.8E-02	3.075	3.022	0.054	0.629	2.15E 02
400.	804.6	147.1	2.01	0.21	2.02	73.5	280.8	20.8	1.6E 06	1.8E-02	3.076	3.022	0.054	0.629	2.15E 02
410.	824.7	147.1	2.01	0.21	2.02	73.5	280.8	20.8	1.6E 06	1.8E-02	3.076	3.021	0.055	0.629	2.15E 02
420.	844.8	147.1	2.01	0.21	2.02	73.5	280.8	20.8	1.6E 06	1.8E-02	3.076	3.021	0.055	0.629	2.15E 02
430.	864.9	147.1	2.01	0.21	2.02	73.5	280.8	20.8	1.6E 06	1.8E-02	3.077	3.021	0.056	0.629	2.15E 02
440.	885.1	147.1	2.01	0.21	2.02	73.5	280.8	20.8	1.6E 06	1.9E-02	3.077	3.021	0.056	0.629	2.15E 02
450.	905.2	147.1	2.01	0.20	2.02	73.5	280.8	20.8	1.6E 06	1.9E-02	3.077	3.020	0.057	0.629	2.15E 02
460.	925.3	147.1	2.01	0.20	2.02	73.5	280.8	20.8	1.6E 06	1.9E-02	3.077	3.020	0.057	0.629	2.15E 02
470.	945.4	147.1	2.01	0.20	2.02	73.5	280.8	20.8	1.6E 06	1.9E-02	3.077	3.020	0.058	0.629	2.15E 02
480.	965.5	147.1	2.01	0.20	2.02	73.5	280.8	20.8	1.6E 06	1.9E-02	3.078	3.020	0.058	0.630	2.15E 02
490.	985.6	147.1	2.01	0.20	2.02	73.5	280.8	20.8	1.6E 06	1.9E-02	3.078	3.019	0.059	0.630	2.15E 02

Exhibit 5. Table of initial plume rise and dilution and nitrogen dioxide formation.

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 330.
SIGMA Y (M) = 150.
SIGMA Z (M) = 35.
SO2-SO4 CONVERSION RATE= 0.0000 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0000 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	1.738	0.071	0.000	4.073	0.000	0.356	0.000	0.000	-0.037	121.587	1.511	0.000
TOTAL AMB!	1.738	0.071	0.000	4.073	0.000	0.356	2.936	0.210	0.001	134.523	1.639	5.096
H+1S												
INCREMENT!	7.790	0.187	0.000	2.401	0.000	1.593	0.000	0.000	-0.038	544.916	6.770	0.000
TOTAL AMB!	7.790	0.187	0.000	2.401	0.000	1.593	2.936	0.047	0.000	557.851	6.898	1.211
H												
INCREMENT!	12.844	0.264	0.000	2.211	0.000	2.627	0.000	0.000	-0.033	898.414	11.162	0.000
TOTAL AMB!	12.844	0.264	0.000	2.211	0.000	2.627	2.936	0.028	0.000	911.349	11.290	0.740
H-1S												
INCREMENT!	7.790	0.187	0.000	2.401	0.000	1.593	0.000	0.000	-0.038	544.915	6.770	0.000
TOTAL AMB!	7.790	0.187	0.000	2.401	0.000	1.593	2.936	0.047	0.000	557.851	6.898	1.211
H-2S												
INCREMENT!	1.738	0.071	0.000	4.073	0.000	0.356	0.000	0.000	-0.037	121.587	1.511	0.000
TOTAL AMB!	1.738	0.071	0.000	4.073	0.000	0.356	2.936	0.210	0.001	134.523	1.639	5.096
0												
INCREMENT!	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AMB!	0.000	0.000	0.000	100.000	0.000	0.000	2.936	100.000	0.038	12.936	0.128	65.142

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit 6. Plume concentrations of aerosol and gases.

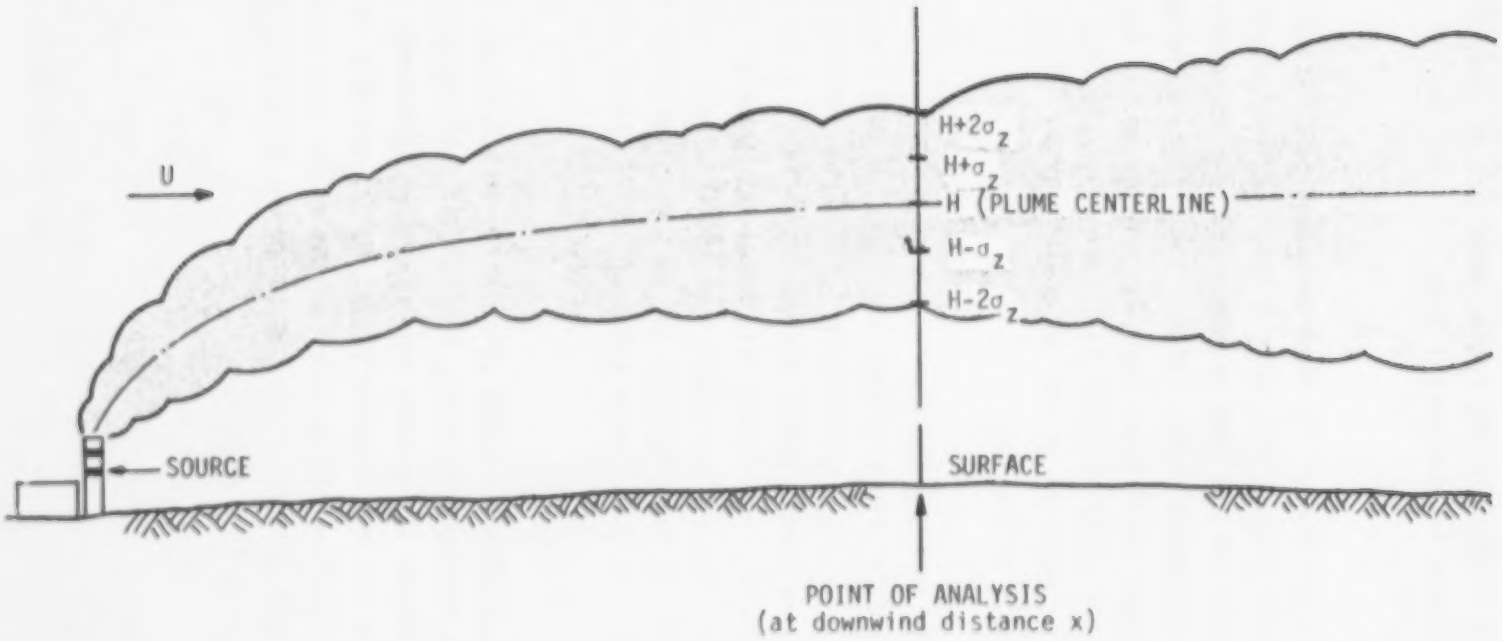

Figure 13 . Schematic diagram of altitudes used to determine plume contribution of gases and aerosols.

Exhibit 7 is an example of the table, generated at each downwind distance, of visual effects for horizontal lines of sight for the plume-based mode of calculation.*

Exhibit 8 is an example of the observer-based calculation of visual effects for horizontal sight paths, with a clear sky background. Most of the optical parameters are the same as those in the plume-based table of visual effects for horizontal sight paths. The difference between the two is that the plume-based table gives data for a range of all significant variables, whereas the observer-based calculations are for the line of sight of the specific geometry of the observer position, plume parcel location, and position of the sun.

Exhibit 9 is an example of a plume-based calculation of the visual effects for nonhorizontal views through the plume, with a clear sky background. These calculations are performed for all combinations of scattering angles (THETA), azimuthal angles between the line of sight and the plume centerline (ALPHA), and line-of-sight elevation angles (BETA). RP is the distance along the line of sight from the observer to the point on the plume centerline and is calculated for each combination of ALPHA and BETA. Note that some of these angle combinations are physically impossible.

Exhibit 10 is an observer-based calculation of the visual effects for nonhorizontal views through the plume, with a clear sky background. The calculation is performed in the same manner as the plume-based method, but it is made only once for the specific THETA, ALPHA, and BETA for the observer position, location of the point on the plume, and scattering angle. The model will skip this calculation if the line-of-sight elevation angle is less than five degrees.

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* These calculations are for views through the plume with a clear sky background. This table gives data for the scattering angles specified by NT1 and NT2 in the input file.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 40.0
PLUME ALTITUDE (M) = 330.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.																
	30.	0.02	167.9	9.22	42.34	71.13	0.3685	0.3749	-17.14	-10.44	-0.2874	0.3736	0.0667	0.0617	47.1943	32.445
	30.	0.05	167.1	9.67	43.82	72.13	0.3527	0.3567	-15.66	-9.44	-0.2658	0.5245	0.0509	0.0435	37.1934	24.756
	30.	0.10	167.1	9.67	46.80	74.08	0.3332	0.3364	-12.69	-7.49	-0.2187	0.7170	0.0315	0.0232	24.2334	15.731
	30.	0.20	167.1	9.67	51.13	76.78	0.3148	0.3189	-8.36	-4.80	-0.1482	0.9068	0.0131	0.0057	11.0906	7.435
	30.	0.50	167.1	9.67	57.03	80.21	0.3025	0.3111	-2.46	-1.36	-0.0465	1.0030	0.0007	-0.0021	2.2125	1.908
	30.	0.80	167.1	9.67	58.74	81.16	0.3017	0.3121	-0.75	-0.41	-0.0150	0.9968	-0.0001	-0.0011	0.8166	0.694
	45.	0.02	172.4	6.84	45.35	73.15	0.3576	0.3686	-14.14	-8.43	-0.2332	0.4198	0.0558	0.0553	41.6851	28.432
	45.	0.05	172.4	6.84	47.05	74.24	0.3435	0.3522	-12.44	-7.33	-0.2074	0.5695	0.0418	0.0390	32.1265	21.284
	45.	0.10	172.4	6.84	49.42	75.74	0.3284	0.3353	-10.06	-5.84	-0.1707	0.7406	0.0267	0.0221	21.2013	13.696
	45.	0.20	172.4	6.84	52.87	77.82	0.3133	0.3198	-6.61	-3.75	-0.1157	0.9109	0.0116	0.0066	9.7382	6.358
	45.	0.50	172.4	6.84	57.55	80.51	0.3026	0.3119	-1.93	-1.07	-0.0363	1.0009	0.0008	-0.0014	1.7370	1.470
	45.	0.80	172.4	6.84	58.90	81.25	0.3018	0.3124	-0.59	-0.32	-0.0117	0.9975	0.0000	-0.0008	0.6292	0.536
	60.	0.02	174.7	5.58	47.30	74.40	0.3496	0.3624	-12.18	-7.17	-0.1992	0.4673	0.0479	0.0492	37.1140	25.115
	60.	0.05	174.7	5.58	48.77	75.33	0.3381	0.3483	-10.72	-6.25	-0.1772	0.6037	0.0363	0.0353	28.7889	19.004
	60.	0.10	174.7	5.58	50.82	76.59	0.3254	0.3338	-8.66	-4.98	-0.1458	0.7599	0.0236	0.0206	19.1364	12.337
	60.	0.20	174.7	5.58	53.80	78.36	0.3122	0.3198	-5.69	-3.21	-0.0988	0.9161	0.0105	0.0066	8.8297	5.709
	60.	0.50	174.7	5.58	57.83	80.66	0.3026	0.3122	-1.66	-0.91	-0.0310	1.0002	0.0008	-0.0010	1.4950	1.249
	60.	0.80	174.7	5.58	58.98	81.30	0.3018	0.3126	-0.50	-0.28	-0.0100	0.9979	0.0000	-0.0007	0.5340	0.455
	90.	0.02	176.1	4.83	48.58	75.21	0.3444	0.3589	-10.91	-6.36	-0.1772	0.5036	0.0426	0.0447	33.8710	22.795
	90.	0.05	176.1	4.83	49.89	76.03	0.3344	0.3457	-9.59	-5.55	-0.1577	0.6301	0.0326	0.0325	26.3829	17.367
	90.	0.10	176.1	4.83	51.73	77.14	0.3232	0.3324	-7.75	-4.43	-0.1297	0.7752	0.0214	0.0192	17.6215	11.345
	90.	0.20	176.1	4.83	54.40	78.71	0.3114	0.3196	-5.08	-2.86	-0.0879	0.9207	0.0096	0.0064	8.1607	5.250
	90.	0.50	176.1	4.83	58.00	80.76	0.3026	0.3124	-1.48	-0.82	-0.0276	0.9998	0.0008	-0.0008	1.3395	1.109
	90.	0.80	176.1	4.83	59.04	81.33	0.3018	0.3126	-0.45	-0.25	-0.0089	0.9981	0.0000	-0.0006	0.4732	0.403

Exhibit 7. Visual effects table for horizontal sight paths with a clear sky background. Plume-based calculations for a 90° scattering angle.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 40.0
PLUME ALTITUDE (M) = 330.
PLUME-OBSERVER DISTANCE (KM) = 49.5
AZIMUTH OF LINE-OF-SIGHT = 26.1
ELEVATION ANGLE OF LINE-OF-SIGHT = -0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.	15.	0.27	149.9	18.95	56.02	79.65	0.3060	0.3087	-11.14	-5.95	-0.1802	1.0003	0.0049	-0.0046	8.6885	7.369

80

Exhibit 8. Observer-based calculation of visual effects for horizontal views through the plume with a clear sky background.

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 40.0
PLUME ALTITUDE (M) = 330.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.															
	30.	15.	2.48	25.37	57.46	0.3386	0.3550	-0.97	-0.92	-0.0226	0.1827	0.0888	0.0983	57.7633	37.9665
	30.	30.	1.19	19.93	51.79	0.3425	0.3565	4.54	5.60	0.3116	0.1302	0.1003	0.1120	53.8330	37.4204
	30.	45.	0.74	17.94	49.46	0.3456	0.3583	6.62	9.31	0.6013	0.1113	0.1059	0.1178	50.7981	36.9105
	30.	60.	0.50	16.99	48.29	0.3479	0.3597	7.59	11.50	0.8230	0.1017	0.1093	0.1212	49.0779	36.7584
	30.	75.	0.37	16.54	47.71	0.3492	0.3607	8.04	12.67	0.9615	0.0967	0.1112	0.1230	48.2481	36.7720
	30.	90.	0.33	16.40	47.54	0.3497	0.3611	8.17	13.04	1.0085	0.0951	0.1118	0.1237	48.0116	36.7995
	45.	15.	1.77	25.16	57.26	0.3225	0.3431	-1.17	-1.12	-0.0258	0.2322	0.0727	0.0864	50.3859	33.0586
	45.	30.	0.87	18.71	50.38	0.3244	0.3418	3.32	4.19	0.2369	0.1762	0.0822	0.0973	46.0057	31.8559
	45.	45.	0.57	16.34	47.46	0.3271	0.3428	5.02	7.31	0.4648	0.1534	0.0874	0.1023	42.9264	31.0935
	45.	60.	0.43	15.23	45.99	0.3291	0.3437	5.83	9.19	0.6399	0.1417	0.0905	0.1052	41.1367	30.7584
	45.	75.	0.35	14.70	45.26	0.3302	0.3443	6.20	10.22	0.7499	0.1359	0.0921	0.1067	40.2159	30.6333
	45.	90.	0.33	14.55	45.04	0.3306	0.3446	6.32	10.54	0.7874	0.1341	0.0927	0.1072	39.9331	30.6033
	60.	15.	1.46	25.16	57.26	0.3127	0.3339	-1.18	-1.12	-0.0252	0.2748	0.0629	0.0773	45.2707	29.6103
	60.	30.	0.74	18.14	49.70	0.3136	0.3315	2.75	3.50	0.2000	0.2146	0.0714	0.0870	41.0308	28.3301
	60.	45.	0.50	15.55	46.42	0.3161	0.3322	4.24	6.27	0.3955	0.1880	0.0764	0.0918	38.1345	27.5731
	60.	60.	0.40	14.34	44.76	0.3180	0.3331	4.94	7.97	0.5458	0.1742	0.0795	0.0946	36.4384	27.2289
	60.	75.	0.35	13.77	43.94	0.3192	0.3337	5.27	8.90	0.6403	0.1672	0.0811	0.0961	35.5540	27.0890
	60.	90.	0.33	13.60	43.69	0.3195	0.3339	5.37	9.19	0.6726	0.1651	0.0816	0.0965	35.2796	27.0521
	90.	15.	1.27	25.19	57.29	0.3060	0.3271	-1.14	-1.09	-0.0240	0.3102	0.0562	0.0704	41.5168	27.0898
	90.	30.	0.66	17.79	49.27	0.3062	0.3240	2.40	3.08	0.1768	0.2467	0.0640	0.0794	37.4838	25.8337
	90.	45.	0.47	15.06	45.75	0.3086	0.3246	3.74	5.60	0.3512	0.2172	0.0689	0.0841	34.7722	25.1188
	90.	60.	0.38	13.78	43.93	0.3105	0.3254	4.37	7.16	0.4854	0.2014	0.0719	0.0869	33.1805	24.7941
	90.	75.	0.34	13.18	43.07	0.3116	0.3260	4.68	8.02	0.5698	0.1935	0.0735	0.0884	32.3471	24.6612
	90.	90.	0.33	13.00	42.80	0.3120	0.3262	4.77	8.30	0.5986	0.1910	0.0741	0.0888	32.0878	24.6258

Exhibit 9. Plume-based calculation of visual effects for nonhorizontal views through the plume with a clear sky background.

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 22.0
PLUME ALTITUDE (M) = 330.
PLUME-OBSERVER DISTANCE (KM) = 1.1
AZIMUTH OF LINE-OF-SIGHT = 14.2
ELEVATION ANGLE OF LINE-OF-SIGHT = 17.7
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
38.															
	13.	90.	1.03	41.14	70.30	0.3807	0.3890	30.33	30.99	2.7088	0.0646	0.1400	0.1467	77.4170	59.8263

Exhibit 10. Observer-based calculation of visual effects for nonhorizontal sight paths through the plume.

Exhibit 11 shows sample results of the plume-based calculations of the visual effects for horizontal views perpendicular to the plume, with white, gray, and black backgrounds. The visual effects are calculated for various observer-plume and observer-object distances for each of the selected scattering angles and three reflectances.

Exhibit 12 shows sample results of the observer-based optics calculations for white, gray, and black background objects. These calculations are performed for the line of sight and for observer-to-plume and observer-to-object distances specified by the input data. Unlike the plume-based calculations, the angle ALPHA between the lines of sight and the plume centerline is not limited to 90 degrees.

Exhibit 13 is a sample output from the plume-based calculations of visual effects along the axis of the plume. This calculation is made for the same set of scattering angles used in the other plume-based calculations, and it is made for views along the plume centerline, the variable of which is the length of the line of sight within the plume. The model calculates the optical effects for views through plume segments that begin at the given downwind distance and end at analysis points successively farther upwind. The shortest seqment ends at the analysis point immediately upwind of the point under consideration, and the longest segment ends at the point nearest the source. (Figure 14 is a schematic diagram of the layout for one point of analysis). The length of the plume segment in kilometers is defined in the column titled LENGTH. The concentrations of coarse mode and accumulation mode aerosols and NO_2 for each segment are obtained from the mean of the endpoint values. The calculations are made for a range of distances from the end of each of these plume segments. All of these plume-based calculations assume a clear background sky.

Exhibit 14 is an example of the output for observer-based calculations of visual effects along the axis of the plume. Unlike the plume-based calculations, these are made for white, gray, and black background objects as well as for the clear sky background. The first data line is for the view with a clear sky background. The second, third, and fourth

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 60.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	72.63	88.28	0.3777	0.3827	-21.96	-9.59	-0.2316	0.5295	0.0442	0.0391	34.1093	24.6740
1.0	0.02	0.05	70.05	87.04	0.3769	0.3813	-20.77	-9.31	-0.2282	0.5261	0.0440	0.0393	33.7198	24.3392
1.0	0.02	0.10	66.37	85.20	0.3753	0.3790	-19.09	-8.89	-0.2227	0.5216	0.0438	0.0396	33.2942	23.9377
1.0	0.02	0.20	60.79	82.28	0.3715	0.3746	-16.60	-8.23	-0.2131	0.5147	0.0438	0.0408	33.0983	23.5509
1.0	0.02	0.50	52.46	77.57	0.3602	0.3657	-13.03	-7.17	-0.1949	0.5017	0.0446	0.0443	34.1845	23.6581
1.0	0.02	0.80	49.67	75.89	0.3537	0.3622	-11.91	-6.82	-0.1879	0.4938	0.0452	0.0462	35.0715	23.9325
1.0	0.05	0.05	71.43	87.70	0.3676	0.3707	-19.40	-8.64	-0.2147	0.6734	0.0346	0.0286	26.9379	19.0907
1.0	0.05	0.10	67.74	85.89	0.3656	0.3680	-17.72	-8.20	-0.2084	0.6666	0.0341	0.0286	26.3145	18.5597
1.0	0.05	0.20	62.16	83.01	0.3612	0.3630	-15.22	-7.49	-0.1972	0.6568	0.0335	0.0291	25.7904	17.9841
1.0	0.05	0.50	53.83	78.38	0.3494	0.3531	-11.65	-6.37	-0.1762	0.6393	0.0338	0.0317	26.4043	17.8743
1.0	0.05	0.80	51.04	76.73	0.3427	0.3493	-10.54	-5.98	-0.1680	0.6290	0.0343	0.0333	27.1649	18.1163
1.0	0.10	0.10	69.66	86.84	0.3544	0.3556	-15.80	-7.24	-0.1879	0.8340	0.0229	0.0162	18.1701	12.7461
1.0	0.10	0.20	64.08	84.02	0.3495	0.3501	-13.30	-6.48	-0.1746	0.8208	0.0218	0.0162	17.2587	11.9472
1.0	0.10	0.50	55.75	79.49	0.3372	0.3395	-9.74	-5.26	-0.1494	0.7978	0.0216	0.0181	17.3044	11.5279
1.0	0.10	0.80	52.96	77.87	0.3305	0.3354	-8.62	-4.83	-0.1397	0.7846	0.0221	0.0194	17.9254	11.7121
1.0	0.20	0.20	66.86	85.45	0.3369	0.3372	-10.52	-5.06	-0.1407	0.9874	0.0092	0.0034	8.4426	6.3962
1.0	0.20	0.50	58.53	81.05	0.3243	0.3262	-6.96	-3.70	-0.1093	0.9583	0.0087	0.0048	7.5876	5.3202
1.0	0.20	0.80	55.74	79.49	0.3178	0.3220	-5.84	-3.22	-0.0972	0.9417	0.0093	0.0060	7.9745	5.3071
1.0	0.50	0.50	62.28	83.08	0.3144	0.3185	-3.20	-1.67	-0.0514	1.0495	-0.0012	-0.0029	2.3700	2.1031
1.0	0.50	0.80	59.49	81.58	0.3081	0.3144	-2.09	-1.13	-0.0358	1.0299	-0.0004	-0.0017	1.4628	1.3505
1.0	0.80	0.80	60.57	82.16	0.3072	0.3146	-1.01	-0.54	-0.0169	1.0299	-0.0013	-0.0014	1.1373	0.8409
0.3	0.02	0.02	29.40	61.16	0.3535	0.3584	-2.13	-1.82	-0.0695	0.7019	0.0307	0.0264	16.7854	11.6157
0.3	0.02	0.05	31.46	62.93	0.3486	0.3551	-3.23	-2.61	-0.0915	0.5949	0.0364	0.0350	22.0708	15.1620
0.3	0.02	0.10	34.40	65.31	0.3438	0.3525	-4.76	-3.58	-0.1167	0.5264	0.0412	0.0424	27.7181	18.7852
0.3	0.02	0.20	38.78	68.62	0.3405	0.3519	-6.99	-4.80	-0.1454	0.4863	0.0446	0.0478	33.1177	22.1574
0.3	0.02	0.50	45.14	73.00	0.3427	0.3566	-10.05	-6.16	-0.1745	0.4765	0.0460	0.0490	36.1701	24.1844
0.3	0.02	0.80	47.17	74.32	0.3457	0.3592	-10.95	-6.50	-0.1815	0.4803	0.0458	0.0481	36.0360	24.2300
0.3	0.05	0.05	32.84	64.06	0.3327	0.3365	-1.85	-1.48	-0.0562	0.8185	0.0205	0.0163	12.2380	7.8780
0.3	0.05	0.10	35.77	66.37	0.3297	0.3357	-3.38	-2.52	-0.0855	0.7001	0.0270	0.0255	18.3487	11.9340
0.3	0.05	0.20	40.16	69.61	0.3281	0.3369	-5.62	-3.82	-0.1187	0.6289	0.0322	0.0327	24.3757	15.8333
0.3	0.05	0.50	46.51	73.90	0.3316	0.3430	-8.68	-5.27	-0.1525	0.6072	0.0350	0.0354	28.0451	18.2964
0.3	0.05	0.80	48.54	75.19	0.3348	0.3460	-9.58	-5.64	-0.1606	0.6115	0.0350	0.0349	28.0405	18.4059
0.3	0.10	0.10	37.69	67.82	0.3147	0.3185	-1.47	-1.07	-0.0410	0.8989	0.0120	0.0084	7.8159	4.7402
0.3	0.10	0.20	42.08	70.95	0.3147	0.3213	-3.76	-2.47	-0.0807	0.7921	0.0188	0.0171	14.3175	8.9548
0.3	0.10	0.50	48.43	75.12	0.3194	0.3286	-6.76	-4.05	-0.1210	0.7572	0.0228	0.0210	18.5915	11.8069
0.3	0.10	0.80	50.46	76.37	0.3228	0.3318	-7.66	-4.45	-0.1308	0.7623	0.0229	0.0207	18.7206	11.9858
0.3	0.20	0.20	44.86	72.82	0.3012	0.3069	-0.92	-0.60	-0.0236	0.9553	0.0054	0.0027	3.7478	2.1999
0.3	0.20	0.50	51.21	76.83	0.3069	0.3150	-3.98	-2.34	-0.0740	0.9076	0.0102	0.0074	8.3988	5.2161
0.3	0.20	0.80	53.24	78.03	0.3103	0.3182	-4.88	-2.79	-0.0862	0.9137	0.0104	0.0071	8.6719	5.4961
0.3	0.50	0.50	54.96	79.04	0.2976	0.3076	-0.23	-0.13	-0.0060	0.9897	0.0009	-0.0000	0.7462	0.4842
0.3	0.50	0.80	56.99	80.19	0.3009	0.3107	-1.13	-0.63	-0.0217	0.9970	0.0010	-0.0004	1.2094	0.9237

Exhibit 11. Plume-based calculations of visual effects for horizontal views perpendicular to the plume, with white, gray, and black backgrounds.

0.3	0.80	0.80	38.06	80.79	0.3001	0.3110	-0.06	-0.03	-0.0018	0.9958	0.0002	-0.0001	0.2165	0.1521
0.0	0.02	0.02	10.87	39.41	0.2966	0.3032	6.36	14.07	1.3903	0.3631	0.0472	0.0486	16.6763	16.3187
0.0	0.02	0.05	14.92	45.57	0.3020	0.3120	4.29	6.58	0.4087	0.3804	0.0473	0.0527	21.1070	15.6010
0.0	0.02	0.10	20.70	52.65	0.3070	0.3216	1.39	1.57	0.0832	0.3987	0.0474	0.0551	28.4951	19.0693
0.0	0.02	0.20	29.36	61.13	0.3159	0.3340	-2.88	-2.44	-0.0765	0.4216	0.0475	0.0553	34.8358	22.6389
0.0	0.02	0.50	42.00	70.89	0.3336	0.3518	-8.78	-5.67	-0.1634	0.4578	0.0467	0.0514	37.2250	24.5138
0.0	0.02	0.80	46.09	73.63	0.3421	0.3578	-10.54	-6.36	-0.1786	0.4728	0.0461	0.0490	36.4725	24.3679
0.0	0.05	0.05	16.30	47.40	0.2821	0.2868	5.67	8.41	0.5237	0.5447	0.0274	0.0275	11.6438	10.3541
0.0	0.05	0.10	22.07	54.14	0.2910	0.3009	2.76	3.05	0.1463	0.5397	0.0314	0.0344	18.0712	12.0440
0.0	0.05	0.20	30.73	62.31	0.3029	0.3172	-1.50	-1.25	-0.0388	0.5476	0.0345	0.0385	25.4729	16.0946
0.0	0.05	0.50	43.37	71.83	0.3226	0.3379	-7.41	-4.73	-0.1396	0.5832	0.0357	0.0374	28.9642	18.5956
0.0	0.05	0.80	47.47	74.51	0.3312	0.3445	-9.17	-5.48	-0.1573	0.6019	0.0353	0.0356	28.4411	18.5424
0.0	0.10	0.10	23.99	56.11	0.2755	0.2818	4.68	5.02	0.2363	0.6980	0.0159	0.0153	8.0676	6.5536
0.0	0.10	0.20	32.65	63.90	0.2895	0.3005	0.42	0.34	0.0149	0.6904	0.0211	0.0218	14.9901	9.1949
0.0	0.10	0.50	45.29	73.11	0.3105	0.3232	-5.49	-3.46	-0.1056	0.7266	0.0236	0.0227	19.3940	12.0788
0.0	0.10	0.80	49.38	75.71	0.3193	0.3302	-7.25	-4.28	-0.1268	0.7499	0.0233	0.0213	19.0920	12.1203
0.0	0.20	0.20	35.43	66.11	0.2767	0.2860	3.20	2.55	0.0953	0.8300	0.0082	0.0073	4.9194	3.6275
0.0	0.20	0.50	48.07	74.89	0.2983	0.3094	-2.71	-1.67	-0.0548	0.8695	0.0114	0.0090	9.1183	5.4478
0.0	0.20	0.80	52.16	77.40	0.3069	0.3166	-4.47	-2.59	-0.0811	0.8983	0.0109	0.0077	9.0191	5.6125
0.0	0.50	0.50	51.82	77.19	0.2894	0.3022	1.05	0.63	0.0186	0.9451	0.0025	0.0018	1.6919	1.1114
0.0	0.50	0.80	55.92	79.58	0.2977	0.3091	-0.72	-0.41	-0.0152	0.9789	0.0017	0.0002	1.4369	0.9239
0.0	0.80	0.80	56.99	80.19	0.2970	0.3094	0.35	0.20	0.0052	0.9771	0.0010	0.0005	0.6604	0.4156

Exhibit 11 (concluded)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 60.0
PLUME-OBSERVER DISTANCE (KM) = 30.6
AZIMUTH OF LINE-OF-SIGHT = 35.7
ELEVATION ANGLE OF LINE-OF-SIGHT = -0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
THETA = 41.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.17	0.56	94.87	97.98	0.3452	0.3423	-10.28	-6.89	-0.1721	0.8437	0.0209	0.0092	18.8304	12.1529
0.3	0.17	0.56	91.11	96.46	0.3391	0.3394	-13.69	-5.37	-0.1408	0.7885	0.0235	0.0120	20.5322	12.5367
0.0	0.17	0.56	89.50	95.79	0.3363	0.3381	-11.73	-4.68	-0.1259	0.7603	0.0248	0.0133	21.4622	12.8576

Exhibit 12. Observer-based calculations of horizontal views through the plume, with white (REFLECT = 1.0), gray (REFLECT = 0.3), and black (REFLECT = 0.0) background objects.

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 60.0

THETA	LENGTH	RP/RVO	RV	PREDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.																
	20.	0.00	59.9	67.65	30.17	61.83	0.4052	0.3840	-29.33	-19.75	-0.5193	0.2323	0.1031	0.0708	61.5959	43.549
	20.	0.02	59.9	67.65	32.50	63.79	0.3791	0.3613	-26.99	-17.79	-0.4803	0.3872	0.0770	0.0480	49.5869	33.977
	20.	0.05	59.9	67.65	35.65	66.28	0.3541	0.3402	-23.85	-15.30	-0.4271	0.5678	0.0519	0.0270	36.7866	25.047
	20.	0.10	59.9	67.65	40.09	69.56	0.3309	0.3220	-19.41	-12.02	-0.3513	0.7694	0.0286	0.0088	23.5992	16.757
	20.	0.20	59.9	67.65	46.60	73.95	0.3113	0.3092	-12.92	-7.64	-0.2376	0.9601	0.0089	-0.0040	11.5355	9.462
	20.	0.50	105.2	43.11	55.62	79.42	0.3009	0.3082	-3.91	-2.18	-0.0735	1.0381	-0.0017	-0.0050	3.5696	3.092
	20.	0.80	153.1	17.24	58.32	80.93	0.3014	0.3112	-1.23	-0.67	-0.0227	1.0216	-0.0014	-0.0020	1.4220	1.088
	40.	0.00	23.5	87.28	28.74	60.58	0.4013	0.3805	-30.76	-21.00	-0.5441	0.2429	0.0990	0.0673	59.4993	42.365
	40.	0.02	26.9	85.46	31.18	62.69	0.3750	0.3578	-28.33	-18.90	-0.5032	0.4039	0.0727	0.0445	47.5866	33.069
	40.	0.05	32.0	82.72	34.46	65.36	0.3503	0.3370	-25.05	-16.23	-0.4475	0.5904	0.0479	0.0238	35.0478	24.468
	40.	0.10	40.4	78.17	39.10	68.85	0.3277	0.3195	-20.42	-12.74	-0.3681	0.7959	0.0253	0.0063	22.3521	16.551
	40.	0.20	57.3	69.05	45.90	73.51	0.3092	0.3077	-13.62	-8.09	-0.2489	0.9852	0.0067	-0.0055	11.1173	9.596
	40.	0.50	105.2	43.11	55.38	79.28	0.3002	0.3078	-4.15	-2.32	-0.0770	1.0505	-0.0025	-0.0054	3.8180	3.253
	40.	0.80	153.1	17.24	58.23	80.88	0.3011	0.3111	-1.31	-0.72	-0.0238	1.0273	-0.0017	-0.0021	1.5649	1.165
	50.	0.00	23.5	87.28	28.72	60.56	0.4011	0.3805	-30.80	-21.03	-0.5443	0.2442	0.0987	0.0673	59.3818	42.314
	50.	0.02	26.9	85.46	31.15	62.67	0.3749	0.3577	-28.36	-18.92	-0.5033	0.4059	0.0724	0.0445	47.4759	33.024
	50.	0.05	32.0	82.72	34.44	65.34	0.3501	0.3370	-25.07	-16.25	-0.4476	0.5931	0.0477	0.0238	34.9487	24.429
	50.	0.10	40.4	78.17	39.08	68.83	0.3276	0.3195	-20.44	-12.76	-0.3681	0.7992	0.0251	0.0062	22.2723	16.521
	50.	0.20	57.3	69.05	45.89	73.50	0.3091	0.3077	-13.64	-8.10	-0.2490	0.9883	0.0066	-0.0055	11.0738	9.580
	50.	0.50	105.2	43.11	55.38	79.28	0.3002	0.3078	-4.16	-2.33	-0.0770	1.0520	-0.0025	-0.0054	3.8220	3.253
	50.	0.80	153.1	17.24	58.23	80.88	0.3011	0.3111	-1.32	-0.72	-0.0238	1.0280	-0.0017	-0.0021	1.5703	1.167
	55.	0.00	23.5	87.28	28.71	60.56	0.4011	0.3805	-30.80	-21.03	-0.5442	0.2446	0.0987	0.0673	59.3595	42.305
	55.	0.02	26.9	85.46	31.15	62.67	0.3748	0.3577	-28.36	-18.92	-0.5033	0.4065	0.0724	0.0445	47.4548	33.015
	55.	0.05	32.0	82.72	34.44	65.34	0.3501	0.3370	-25.08	-16.25	-0.4476	0.5939	0.0476	0.0238	34.9293	24.421
	55.	0.10	40.4	78.17	39.08	68.83	0.3276	0.3195	-20.44	-12.76	-0.3681	0.8001	0.0251	0.0062	22.2560	16.514
	55.	0.20	57.3	69.05	45.89	73.50	0.3091	0.3077	-13.64	-8.10	-0.2490	0.9892	0.0065	-0.0055	11.0634	9.576
	55.	0.50	105.2	43.11	55.38	79.28	0.3002	0.3078	-4.16	-2.33	-0.0770	1.0525	-0.0026	-0.0054	3.8221	3.253
	55.	0.80	153.1	17.24	58.23	80.88	0.3011	0.3111	-1.32	-0.72	-0.0238	1.0282	-0.0017	-0.0021	1.5714	1.167
	58.	0.00	23.5	87.28	28.71	60.56	0.4011	0.3805	-30.80	-21.03	-0.5442	0.2448	0.0987	0.0673	59.3489	42.301
	58.	0.02	26.9	85.46	31.15	62.67	0.3748	0.3577	-28.36	-18.93	-0.5033	0.4069	0.0724	0.0445	47.4446	33.011
	58.	0.05	32.0	82.72	34.44	65.34	0.3501	0.3370	-25.08	-16.25	-0.4476	0.5944	0.0476	0.0238	34.9199	24.417
	58.	0.10	40.4	78.17	39.08	68.83	0.3276	0.3195	-20.44	-12.76	-0.3681	0.8007	0.0251	0.0062	22.2477	16.511
	58.	0.20	57.3	69.05	45.89	73.50	0.3091	0.3077	-13.64	-8.10	-0.2489	0.9897	0.0065	-0.0055	11.0582	9.573
	58.	0.50	105.2	43.11	55.38	79.28	0.3002	0.3078	-4.16	-2.33	-0.0770	1.0527	-0.0026	-0.0054	3.8222	3.252
	58.	0.80	153.1	17.24	58.23	80.88	0.3011	0.3111	-1.32	-0.72	-0.0238	1.0284	-0.0017	-0.0021	1.5718	1.168
	59.	0.00	23.5	87.28	28.71	60.56	0.4011	0.3805	-30.80	-21.03	-0.5442	0.2449	0.0987	0.0673	59.3456	42.299
	59.	0.02	26.9	85.46	31.15	62.67	0.3748	0.3577	-28.36	-18.93	-0.5033	0.4070	0.0724	0.0445	47.4415	33.010
	59.	0.05	32.0	82.72	34.44	65.34	0.3501	0.3370	-25.08	-16.25	-0.4476	0.5945	0.0476	0.0238	34.9170	24.416
	59.	0.10	40.4	78.17	39.08	68.83	0.3276	0.3195	-20.44	-12.76	-0.3681	0.8008	0.0251	0.0062	22.2452	16.510
	59.	0.20	57.3	69.05	45.89	73.50	0.3091	0.3077	-13.64	-8.10	-0.2489	0.9899	0.0065	-0.0055	11.0566	9.573
	59.	0.50	105.2	43.11	55.38	79.28	0.3002	0.3078	-4.16	-2.33	-0.0770	1.0528	-0.0026	-0.0054	3.8222	3.252
	59.	0.80	153.1	17.24	58.23	80.88	0.3011	0.3111	-1.32	-0.72	-0.0238	1.0284	-0.0017	-0.0021	1.5720	1.168

Exhibit 13. Plume-based calculations of visual effects for lines of sight along the axis of the plume.

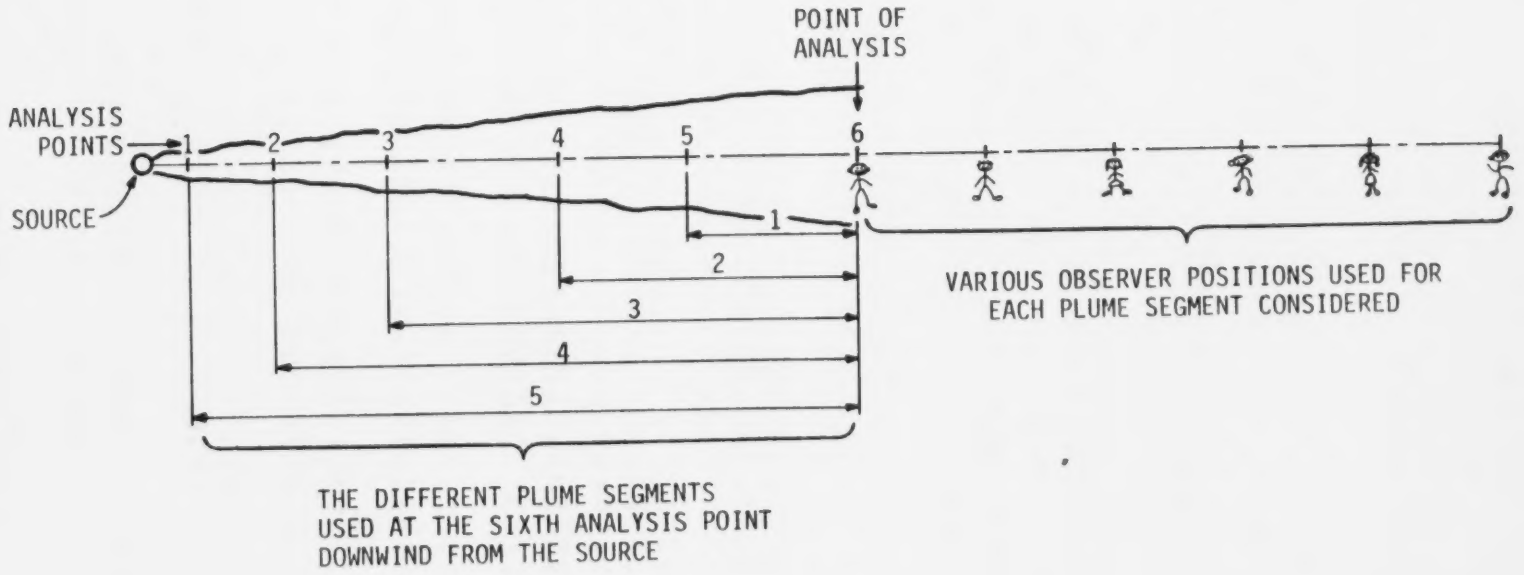

Figure 14. Schematic diagram of plume-based "along plume" optics calculation.

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME

1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME-OBSERVER DISTANCE (KM) = 17.5
AZIMUTH OF LINE-OF-SIGHT = 145.1
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
42.																
FOR SKY BACKGROUND:																
10.	0.09	165.8	10.38	105.25	101.99	0.3439	0.3523		-9.09	-3.30	-0.0772	0.7572	0.0216	0.0184	19.9524	12.717
FOR WHITE BACKGROUND:																
10.	0.09	165.8	10.39	105.36	102.03	0.3466	0.3522		-9.11	-3.30	-0.0769	0.7631	0.0214	0.0183	19.7874	12.649
FOR GRAY BACKGROUND:																
10.	0.09	165.5	10.57	103.55	101.36	0.3437	0.3512		-8.17	-3.00	-0.0705	0.7487	0.0222	0.0191	20.5127	12.973
FOR BLACK BACKGROUND:																
10.	0.09	165.3	10.64	102.78	101.06	0.3425	0.3507		-7.77	-2.87	-0.0677	0.7420	0.0225	0.0194	20.8360	13.120

Exhibit 14. Observer-based calculations of visual effects for views close to the plume trajectory. The first line is data for clear sky background. The second, third, and fourth lines are for white, gray, and black backgrounds, respectively.

lines show the results for white, gray, and black backgrounds, respectively. The calculations are made for the defined observer position, with the line of sight intersecting the plume at the user-specified distance downwind of the source. The model uses the plume centerline concentration for this point. This concentration is integrated along the line of sight, and the length of this integration is calculated to correspond to a Gaussian plume distribution. The azimuthal angle between the line of sight and the plume centerline is included. As in the results for the plume-based calculations, LENGTH indicates the distance over which the plume centerline concentrations are applied. The percentage of reduction in visual range is defined only for the clear sky background. The remaining optical parameters compare the visual effects of looking through the plume to looking at the background without it.

Exhibit 15 is an example of the printed results of the OH• model calculations of the conversion rates of SO_2 to $SO_4^=$ and NO_x to HNO_3^-. For each downwind distance, the conversion rates are shown for each point upwind. These rates are based on the solar radiation for the time of day at which a plume parcel is at the given distance downwind of the source. The output shows the conversion rates for plume parcels as they advect to each analysis point along the plume trajectory. The conversion rates are calculated for the six altitudes shown in figure 13.

The last two tables (see exhibit 16) verify the values of visual range reduction, blue-red ratio, plume contrast, and $\Delta E(L^*a^*b^*)$ written to logical files 7 and 8. These files are the input data for the plotting program (VISPLOT). Exhibit 16 shows the format of the tables set for sixteen analysis points and four backgrounds. The visual range reduction data are set to zero for white, gray, and black backgrounds, since visual range is defined for a horizon sky background. The values saved for plotting are taken from the calculations for horizontal views of the plume with a sky background and from the calculations for horizontal views of white, gray, and black backgrounds behind the plume. The model prints both tables for plume-based and observer-based data only if both calculations are done. If PLUVUE is run for observer-based calculations or

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE =, 240.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	2359	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.7	32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.4	114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.8	237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	522	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.04
8.3	808	0.00	0.00	0.00	0.00	0.00	0.94	0.01	0.00	0.00	0.00	0.01	6.61
11.0	1054	0.01	0.00	0.00	0.00	0.01	2.95	0.09	0.02	0.01	0.02	0.09	20.65
13.8	1340	0.01	0.00	0.00	0.00	0.01	1.89	0.08	0.01	0.01	0.01	0.08	13.26
16.6	1625	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.93
19.3	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.1	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.9	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27.6	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.4	614	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.01	0.38
33.1	900	0.04	0.01	0.00	0.01	0.04	1.66	0.28	0.04	0.02	0.04	0.28	11.64

Exhibit 15. Conversion rates for secondary aerosol formation calculated by the OH· model for a plume parcel 240 km from the source at the time of observation (0900).

PLOT FILE VERIFICATION

OBSERVER-BASED DATA

SKY BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	52.530	52.937	53.826	51.327	40.167	27.501	16.039	7.419	10.637	23.591	40.679	47.959	45.806	43.730	42.247	41.06
BLUE-RED RATIO	1.022	1.021	1.019	1.014	1.003	0.956	0.861	0.742	0.758	0.858	0.923	0.951	0.957	0.958	0.957	0.95
PLUME CONTRAST AT 0.55 MICRONS	-0.057	-0.070	-0.082	-0.090	-0.105	-0.135	-0.153	-0.111	-0.084	-0.112	-0.094	-0.068	-0.046	-0.030	-0.019	-0.01
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	2.312	2.814	3.333	3.621	4.148	5.491	8.602	12.527	12.982	8.315	5.066	3.462	2.386	1.677	1.206	0.91
WHITE BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	1.259	1.248	1.219	1.187	1.146	1.065	0.934	0.757	0.766	0.903	1.089	0.000	0.000	0.000	0.000	0.00
PLUME CONTRAST AT 0.55 MICRONS	-0.088	-0.100	-0.111	-0.118	-0.132	-0.162	-0.180	-0.114	-0.085	-0.122	-0.045	0.000	0.000	0.000	0.000	0.00
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	5.061	5.232	5.344	5.290	5.397	5.971	8.184	12.323	12.845	7.558	3.153	0.000	0.000	0.000	0.000	0.00
GRAY BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.996	0.996	0.996	0.994	0.985	0.939	0.846	0.740	0.752	0.799	0.872	0.000	0.000	0.000	0.000	0.00
PLUME CONTRAST AT 0.55 MICRONS	-0.026	-0.040	-0.054	-0.063	-0.079	-0.110	-0.129	-0.107	-0.078	-0.045	0.173	0.000	0.000	0.000	0.000	0.00
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	1.006	1.575	2.155	2.531	3.188	4.874	8.398	12.601	13.160	8.819	6.239	0.000	0.000	0.000	0.000	0.00

(a) Observer-based calculations.

Exhibit 16. Verification of data for plotting results of observer-based and plume-based calculations.

BLACK BACKGROUND

NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.882	0.886	0.894	0.902	0.904	0.871	0.791	0.732	0.745	0.740	0.729	0.000	0.000	0.000	0.000	0.00
PLUME CONTRAST AT 0.55 MICRONS	0.003	-0.011	-0.026	-0.037	-0.054	-0.084	-0.102	-0.104	-0.075	-0.004	0.314	0.000	0.000	0.000	0.000	0.00
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	2.137	2.279	2.446	2.650	3.234	5.126	8.925	12.729	13.303	10.133	11.038	0.000	0.000	0.000	0.000	0.00

Exhibit 16(a) (concluded)

PLOT FILE VERIFICATION

PLUME-BASED DATA

SKY BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	11.973	9.556	6.737	5.153	4.127	3.519	3.288	3.166	3.086	3.027	2.979	2.940	2.908	2.570	2.213	1.96
BLUE-RED RATIO	0.921	0.857	0.827	0.825	0.819	0.808	0.801	0.796	0.793	0.791	0.790	0.789	0.789	0.801	0.818	0.83
PLUME CONTRAST AT 0.55 MICRONS	-0.094	-0.108	-0.106	-0.098	-0.094	-0.095	-0.097	-0.099	-0.100	-0.101	-0.101	-0.101	-0.101	-0.092	-0.081	-0.07
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	4.864	7.459	8.674	8.601	8.758	9.270	9.619	9.862	10.024	10.125	10.184	10.214	10.223	9.523	8.617	7.91
WHITE BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	1.101	0.985	0.909	0.836	0.866	0.844	0.833	0.826	0.821	0.818	0.816	0.815	0.814	0.824	0.837	0.84
PLUME CONTRAST AT 0.55 MICRONS	-0.169	-0.169	-0.152	-0.135	-0.124	-0.121	-0.121	-0.122	-0.123	-0.123	-0.123	-0.123	-0.122	-0.111	-0.098	-0.03
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	6.447	7.392	8.359	8.361	8.637	9.291	9.721	10.015	10.212	10.338	10.414	10.452	10.465	9.753	8.827	8.10
GRAY BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.890	0.849	0.836	0.840	0.840	0.834	0.830	0.827	0.825	0.824	0.823	0.823	0.823	0.834	0.848	0.85
PLUME CONTRAST AT 0.55 MICRONS	0.010	-0.022	-0.043	-0.047	-0.052	-0.059	-0.064	-0.067	-0.068	-0.070	-0.070	-0.071	-0.071	-0.065	-0.058	-0.05
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	3.975	5.865	6.657	6.541	6.612	6.954	7.194	7.361	7.472	7.541	7.580	7.596	7.598	7.036	6.425	5.90

Exhibit 16(b). Plume-based calculations.

BLACK BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.637	0.648	0.689	0.726	0.752	0.767	0.773	0.775	0.777	0.778	0.780	0.781	0.782	0.798	0.817	0.83
PLUME CONTRAST AT 0.55 MICRONS	0.192	0.128	0.069	0.042	0.021	0.003	-0.005	-0.010	-0.013	-0.016	-0.017	-0.018	-0.018	-0.018	-0.017	-0.01
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	9.360	9.262	8.329	7.441	6.937	6.827	6.857	6.901	6.932	6.946	6.947	6.941	6.931	6.427	5.801	5.32

Exhibit 16(b) (concluded)

plume-based calculations, the model writes only the proper plot file and prints the corresponding table.

The plot files are written in the same order that the data are printed in the tables of exhibit 16. Exhibit 17 shows the binary FORTRAN write statements that generate these files. These four statements write the values of the four arrays: visual range reduction, blue-red ratio, plume contrast, and $\Delta E(L^*a^*b^*)$. For each of the four arrays, the data are organized such that the first sixteen elements are for a sky background, the second sixteen elements are for a white background, the third sixteen elements are for a gray background, and the last sixteen elements are for a black background. Each group of sixteen elements corresponds to the sixteen downwind distances.

```
      WRITE(6,50001)
50001 FORMAT(1H1,55X,22HPLOT FILE VERIFICATION)
      IF(NC2.NE.2)GO TO 30025
C
C  WRITE OUT THE VISUAL IMPACT PARAMETERS FOR PLOTTING OF THE
C  RESULTS OF OBSERVER-BASED CALCULATIONS. PLT1 IS PERCENT REDUCTION
C  IN VISUAL RANGE, FOR THE 16 DOWNWIND POINTS.NN=1 FOR CLEAR
C  SKY BACKGROUND. NN=2 FOR WHITE BACKGROUND.  NN=3 FOR GRAY
C  BACKGROUND.  NN=4 FOR BLACK BACKGROUND.  PLT1 IS SET TO
C  ZERO FOR NN=2,3,4. PLT2 = BLUE-RED RATIO.  PLT3 = PLUME
C  CONTRAST AT 0.55 MICROMETER.  PLT4 = DELTA E(LAB).
C
      WRITE(7)((PLT1(NX,NN),NX=1,16),NN=1,4)
      WRITE(7)((PLT2(NX,NN),NX=1,16),NN=1,4)
      WRITE(7)((PLT3(NX,NN),NX=1,16),NN=1,4)
      WRITE(7)((PLT4(NX,NN),NX=1,16),NN=1,4)
      WRITE(6,50002)
50002 FORMAT(1H0,56X,19HOBSERVER-BASED DATA)


      IF(NC1.NE.1)GO TO 30030
C
C  VISUAL IMPACT PARAMETERS FOR PLOTTING OF THE RESULTS OF
C  THE PLUME-BASED CALCULATIONS WITH THE DESIRED SCATTERING ANGLE
C  DISTANCES, AND PLUME-OBSERVER GEOMETRY AS SPECIFIED IN THE
C  PLUME-BASED CALCULATIONS FOR CLEAR SKY AND WHITE, GRAY, AND
C  BLACK BACKGROUNDS.
C
30025 CONTINUE
      WRITE(8)((PLOT1(NX,NN),NX=1,16),NN=1,4)
      WRITE(8)((PLOT2(NX,NN),NX=1,16),NN=1,4)
      WRITE(8)((PLOT3(NX,NN),NX=1,16),NN=1,4)
      WRITE(3)((PLOT4(NX,NN),NX=1,16),NN=1,4)
      IF(NC2.NE.1)WRITE(6,50001)
      WRITE(6,50017)
50017 FORMAT(1H0,57X,16HPLUME-BASED DATA)
```

Exhibit 17. Binary FORTRAN write statements that generate data files to be used for plotting results.

5 PLUVUE PROCEDURE FLOW CHART

The procedure flow of PLUVUE is represented in the following figures. Figure 15(a) depicts the relationship of input and output to a PLUVUE model execution. Figure 15(b) illustrates the general procedure flow of PLUVUE. This diagram provides the user with a guide to the general organization of the model. Figure 15(c) is a more detailed flow diagram of MAIN. This still represents the general procedure flow without considering the details of each individual step. Figures 15(d), 15(e), and 15(f) provide flow diagrams of the subroutines PERDIF, INRAD, and BSIZE, respectively. These diagrams represent the flow of the program execution in these routines without attempting to represent individual lines. The other subroutines of PLUVUE are so short that procedure flow diagrams are not useful at the level of detail being presented. Line-by-line examination of the source-code listing is necessary for understanding the details of the remaining routines.

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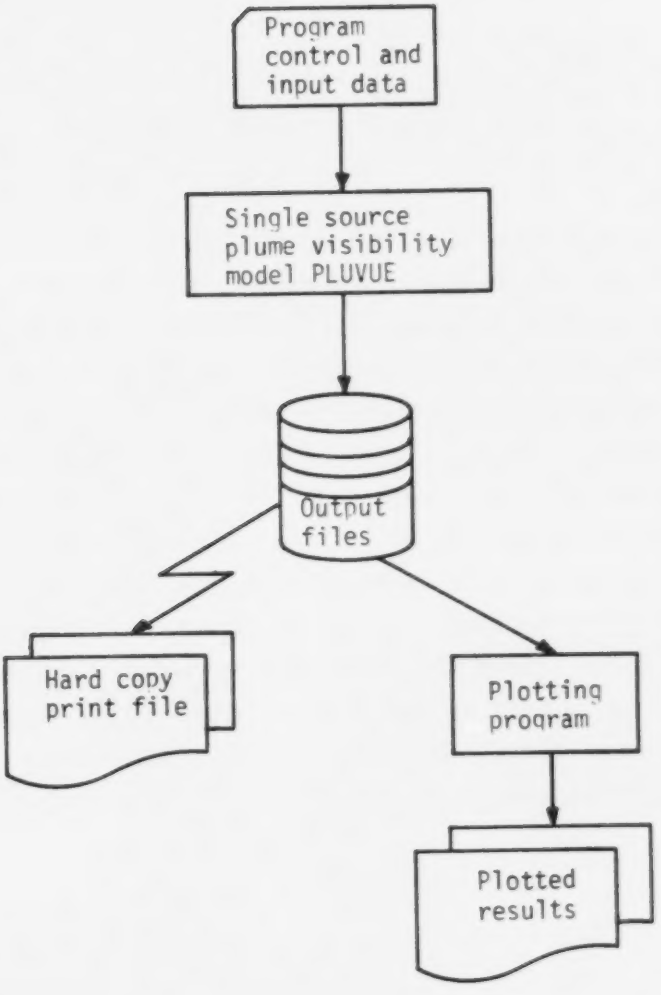
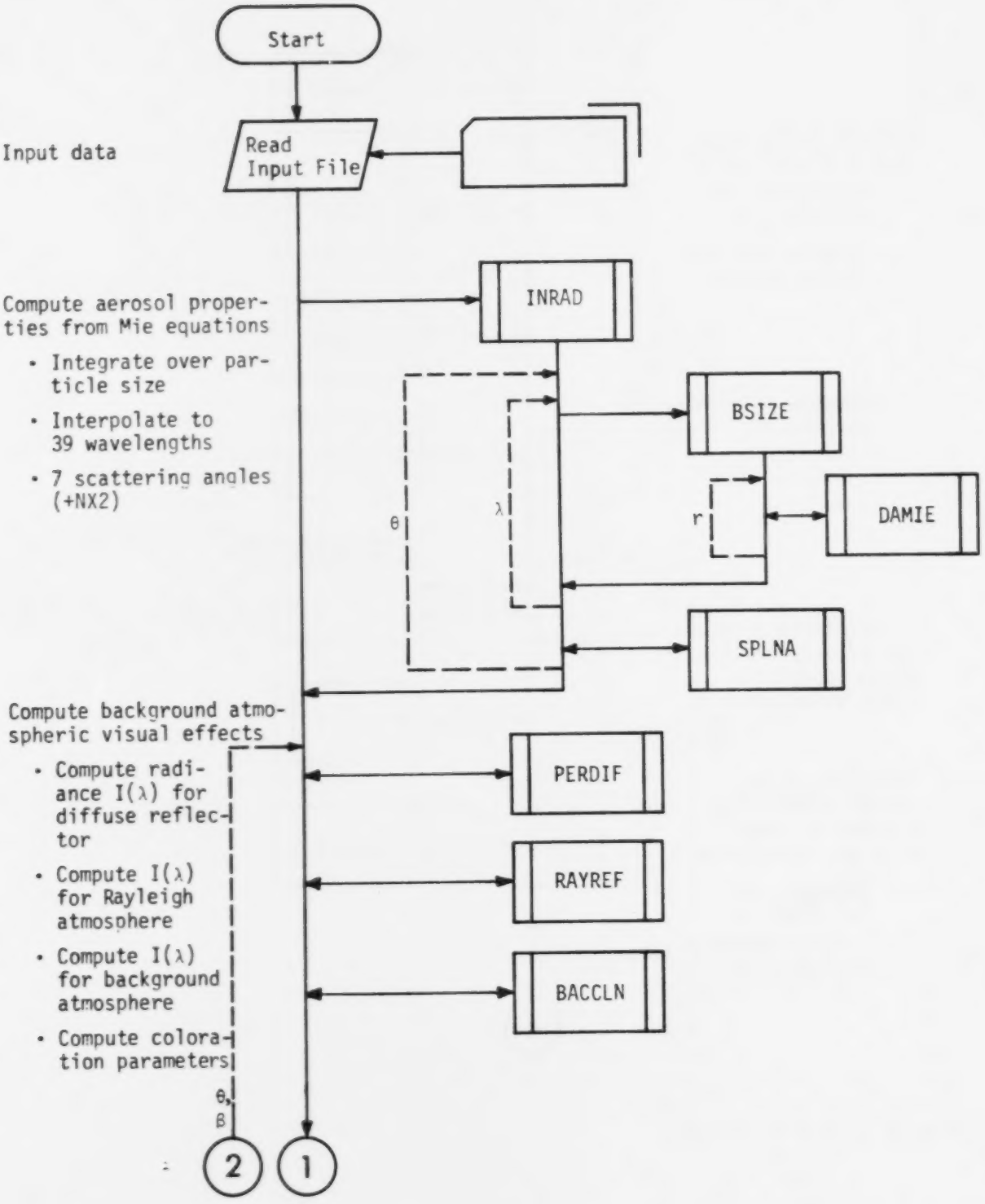


(a) Relation of I/O to PLUVUE.

Figure 15. PLUVUE logic flow chart.



(b) Overview of the PLUVUE structure.

Figure 15 (continued)

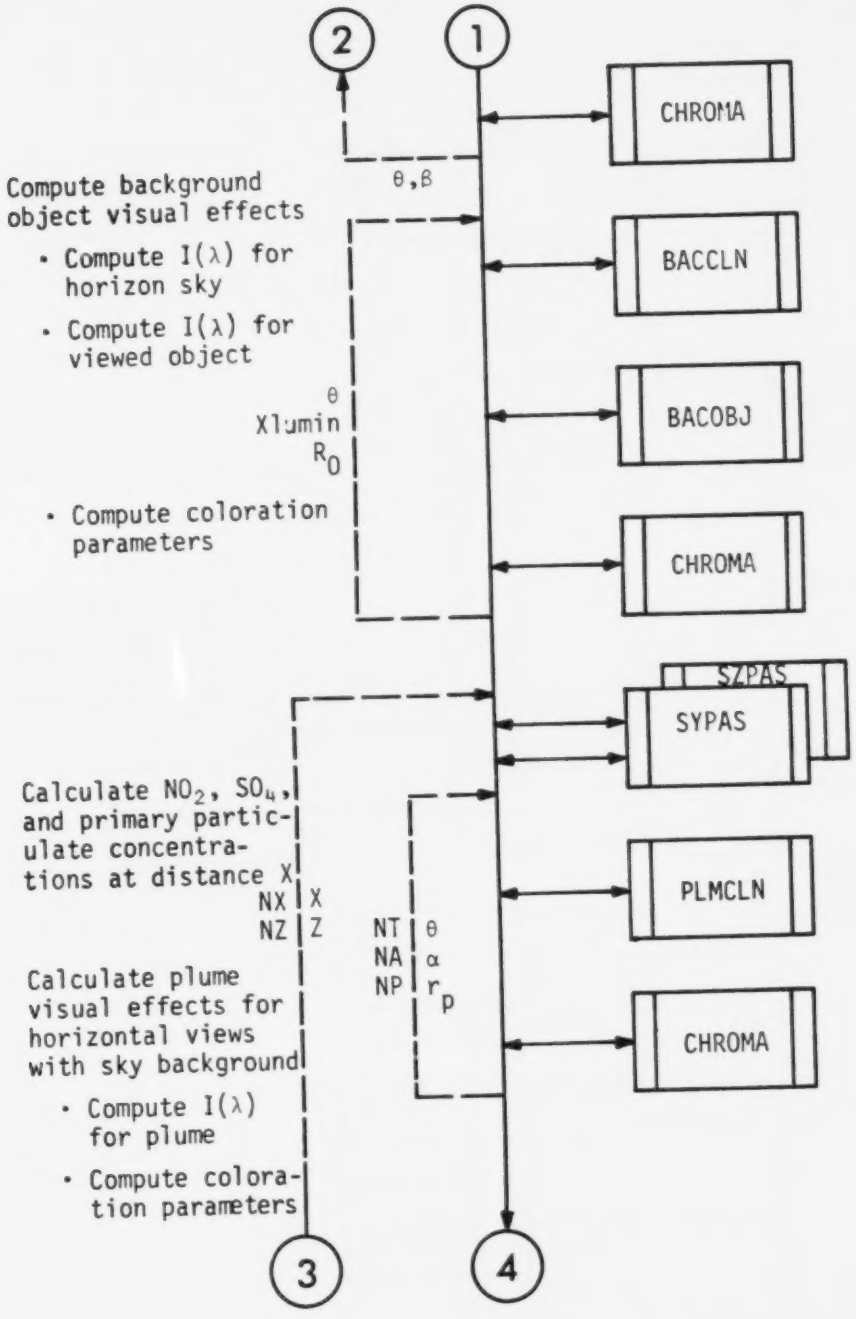


Figure 15(b) (continued)

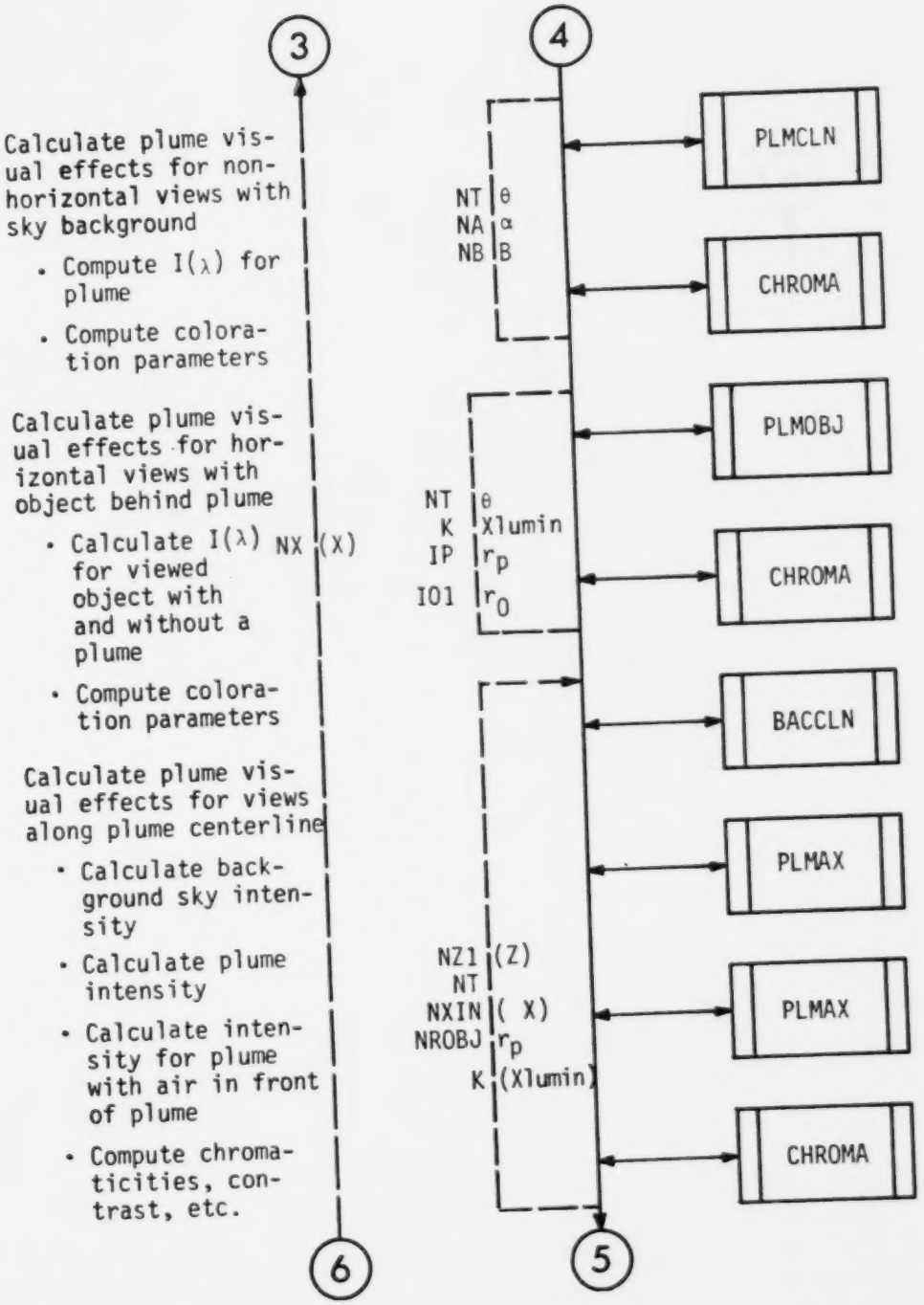


Figure 15(b) (continued)

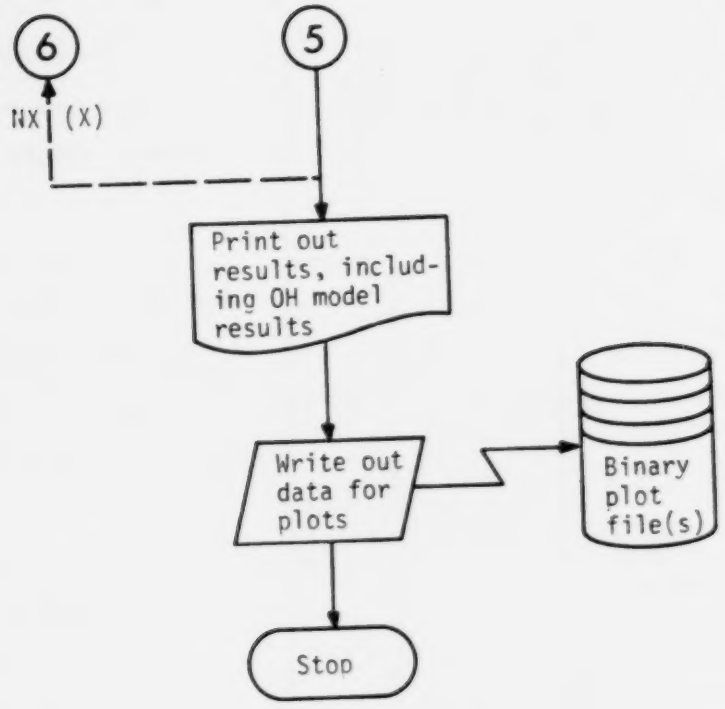
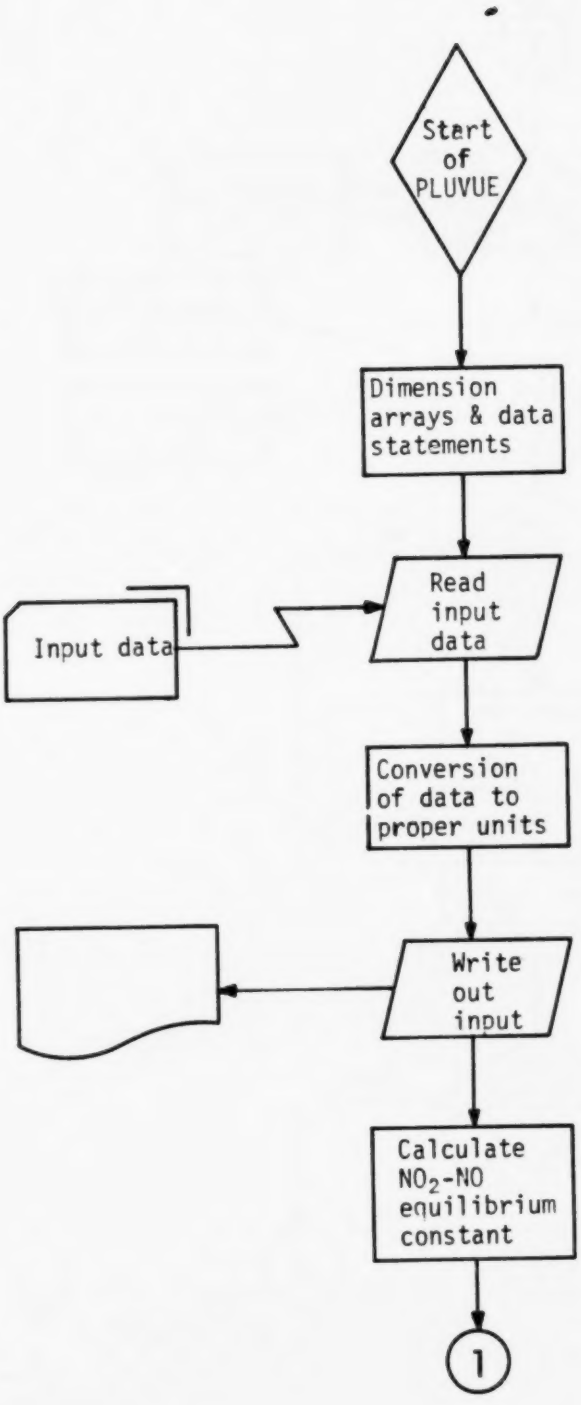


Figure 15(b) (concluded)



(c) Flow chart of MAIN.

Figure 15 (continued)

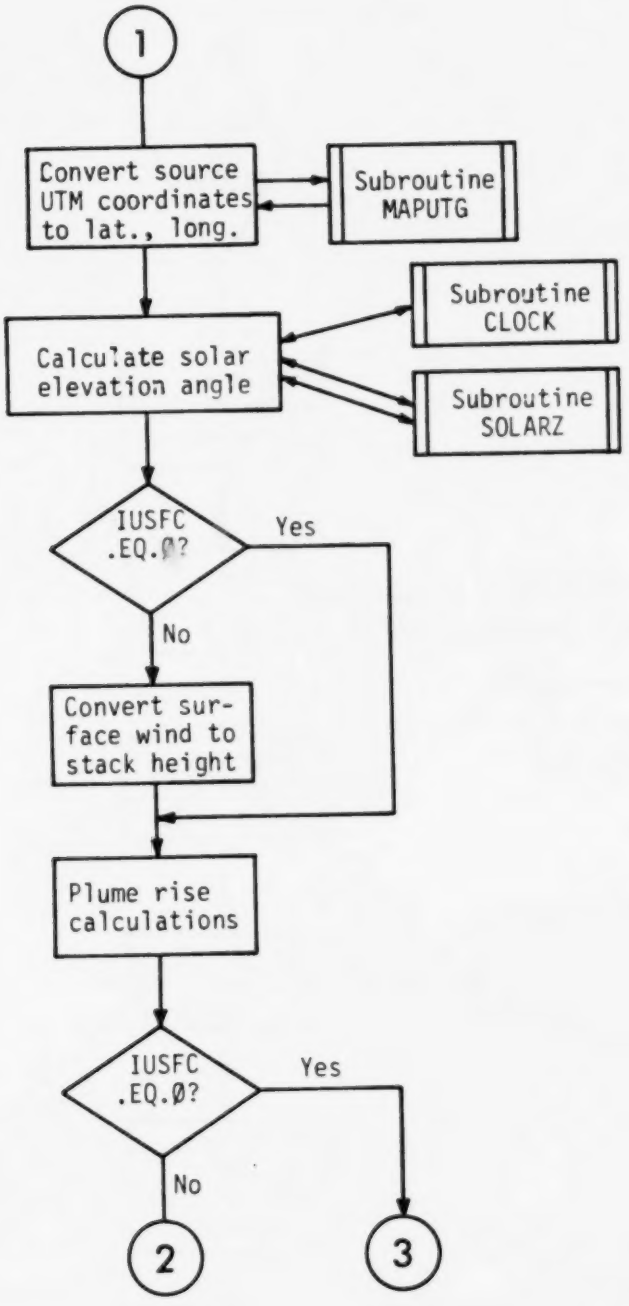


Figure 15(c) (continued)

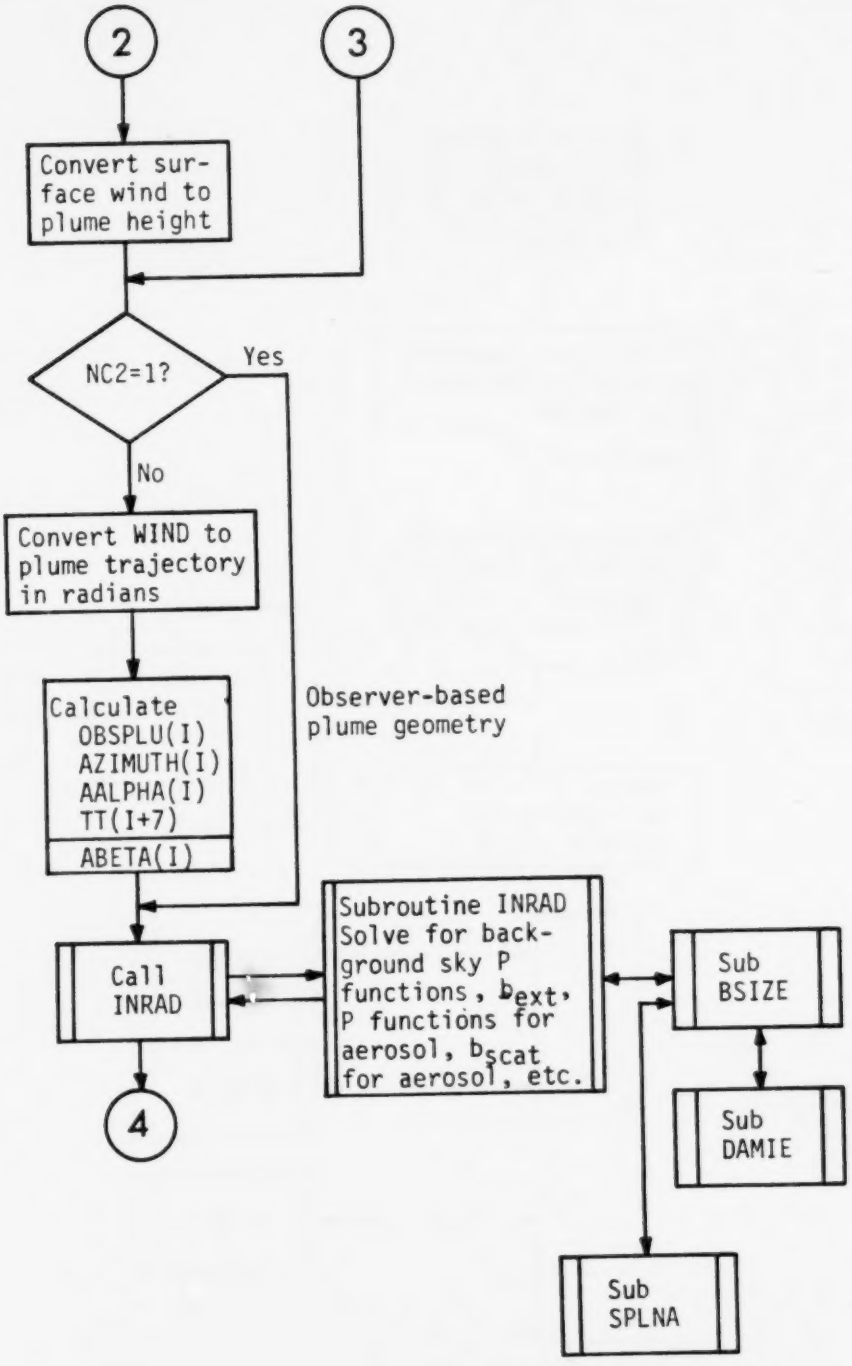


Figure 15(c) (continued)

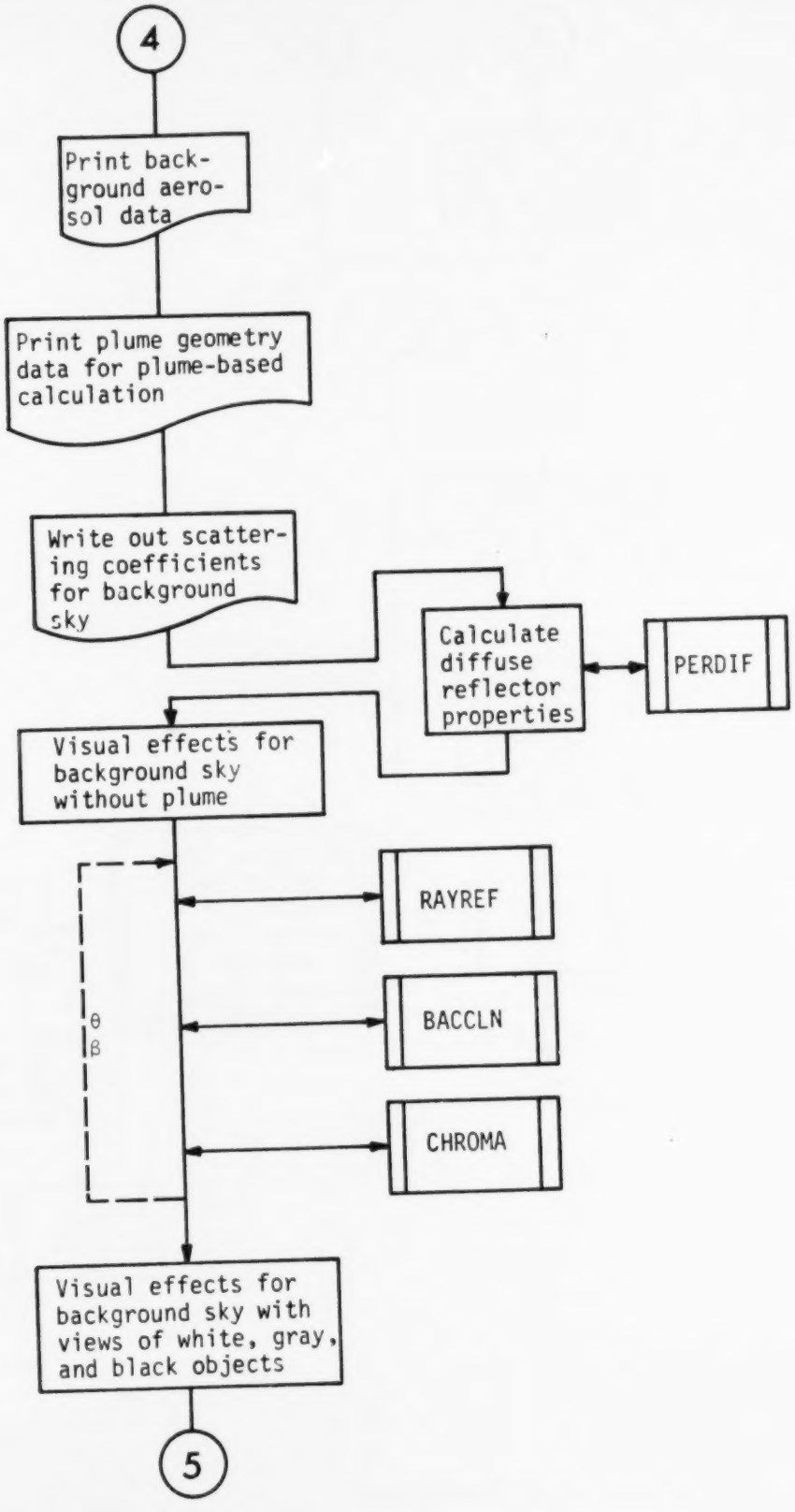


Figure 15(c) (continued)

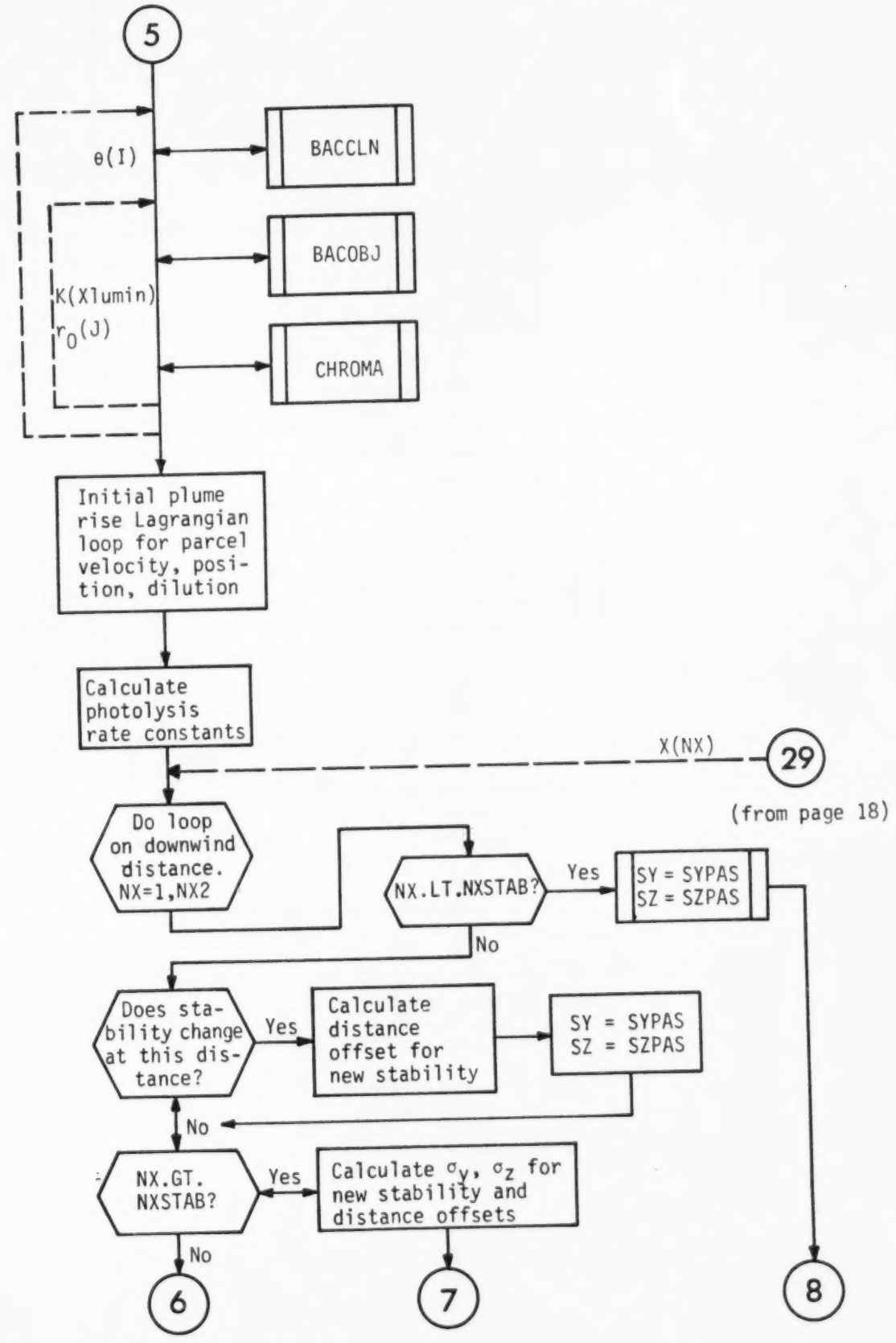


Figure 15(c) (continued)

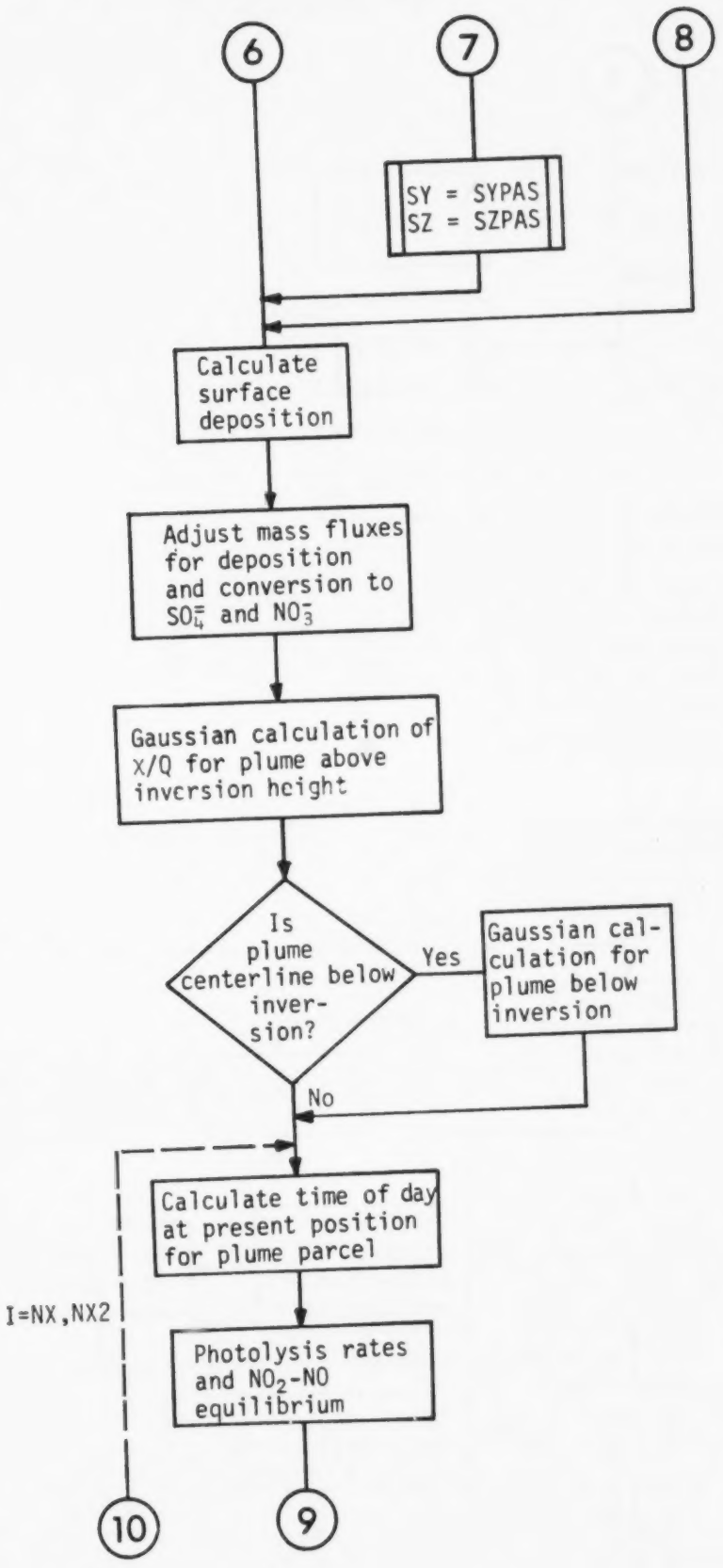


Figure 15(c) (continued)

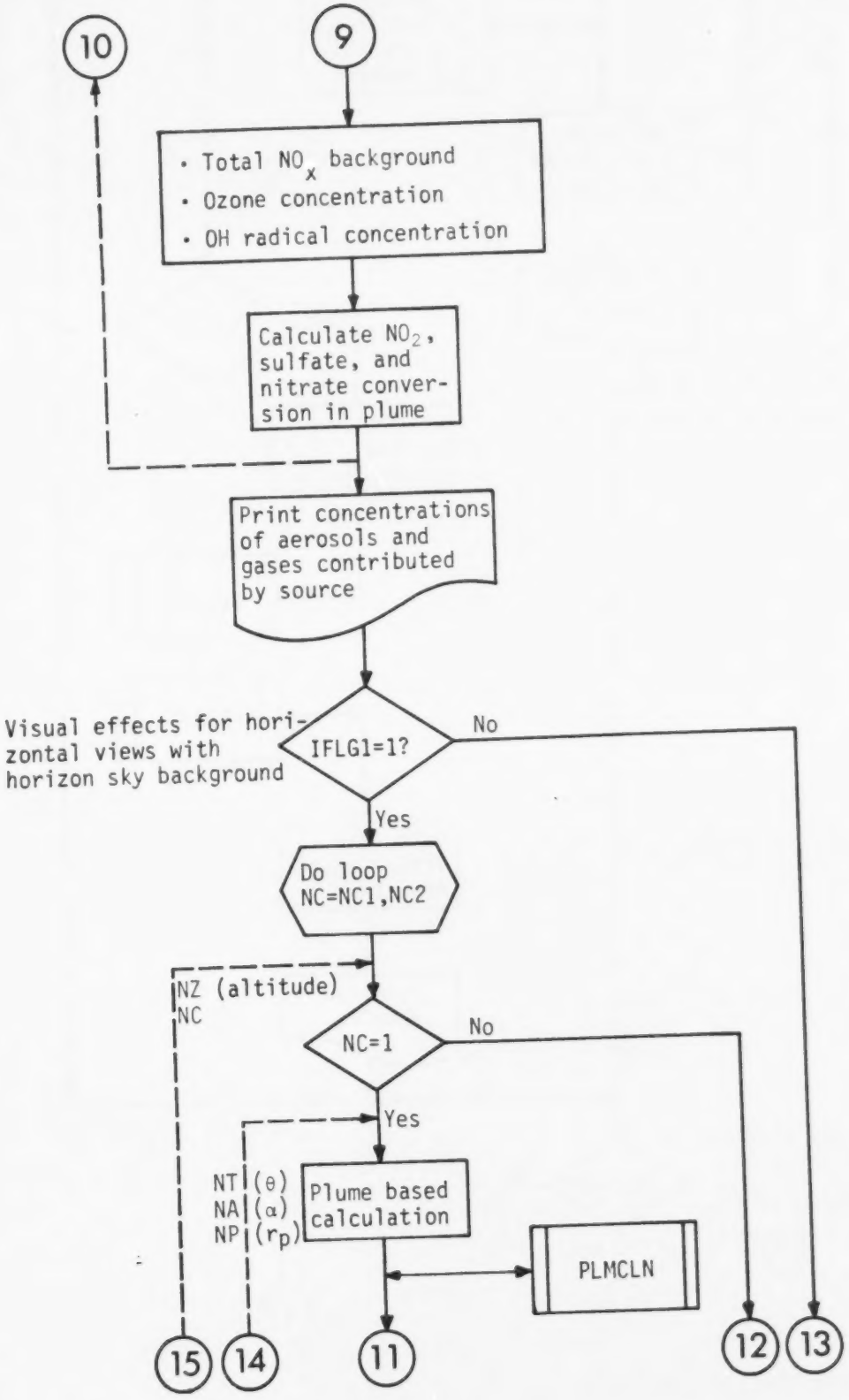


Figure 15(c) (continued)

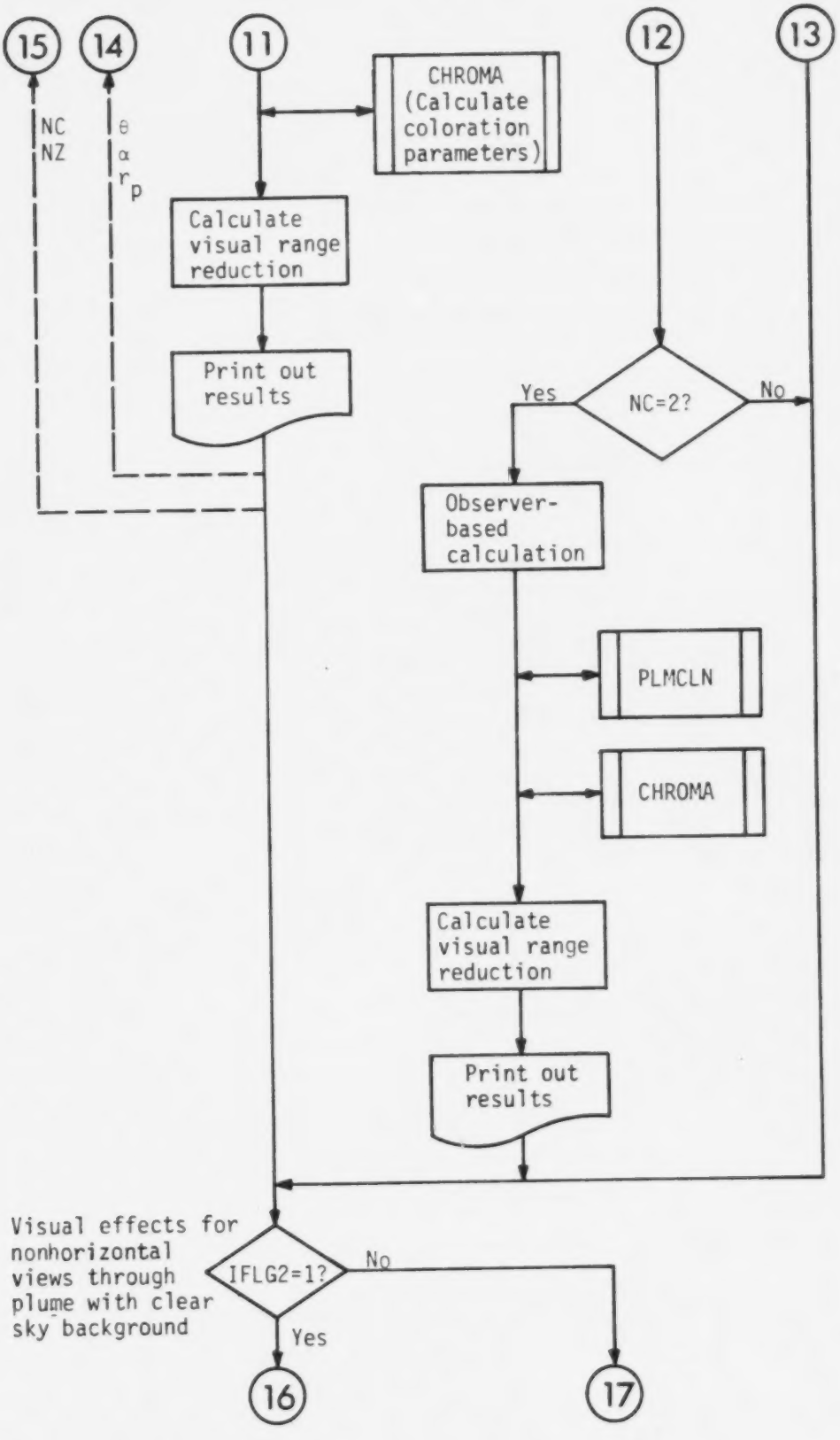


Figure 15(c) (continued)

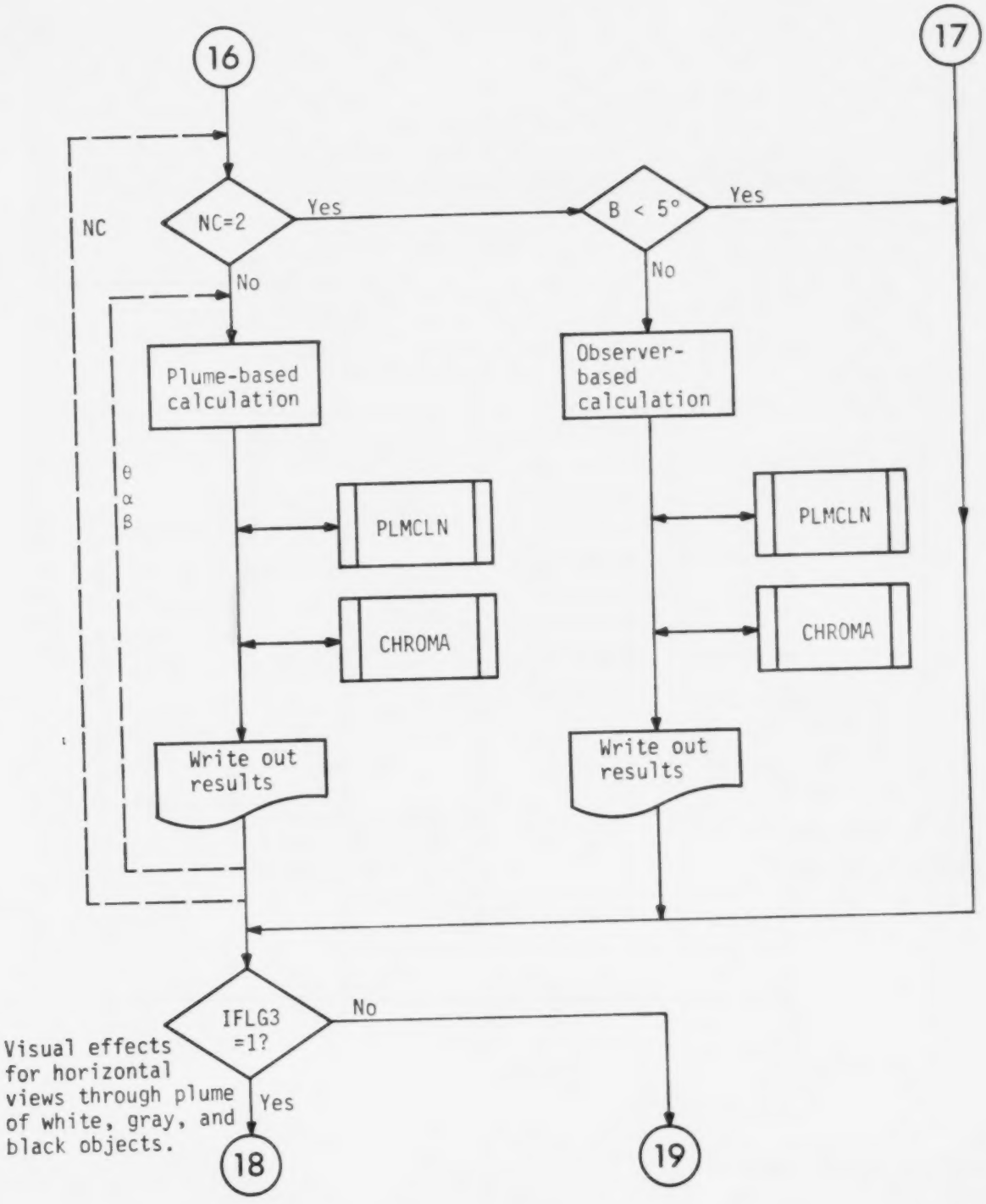


Figure 15(c) (continued)

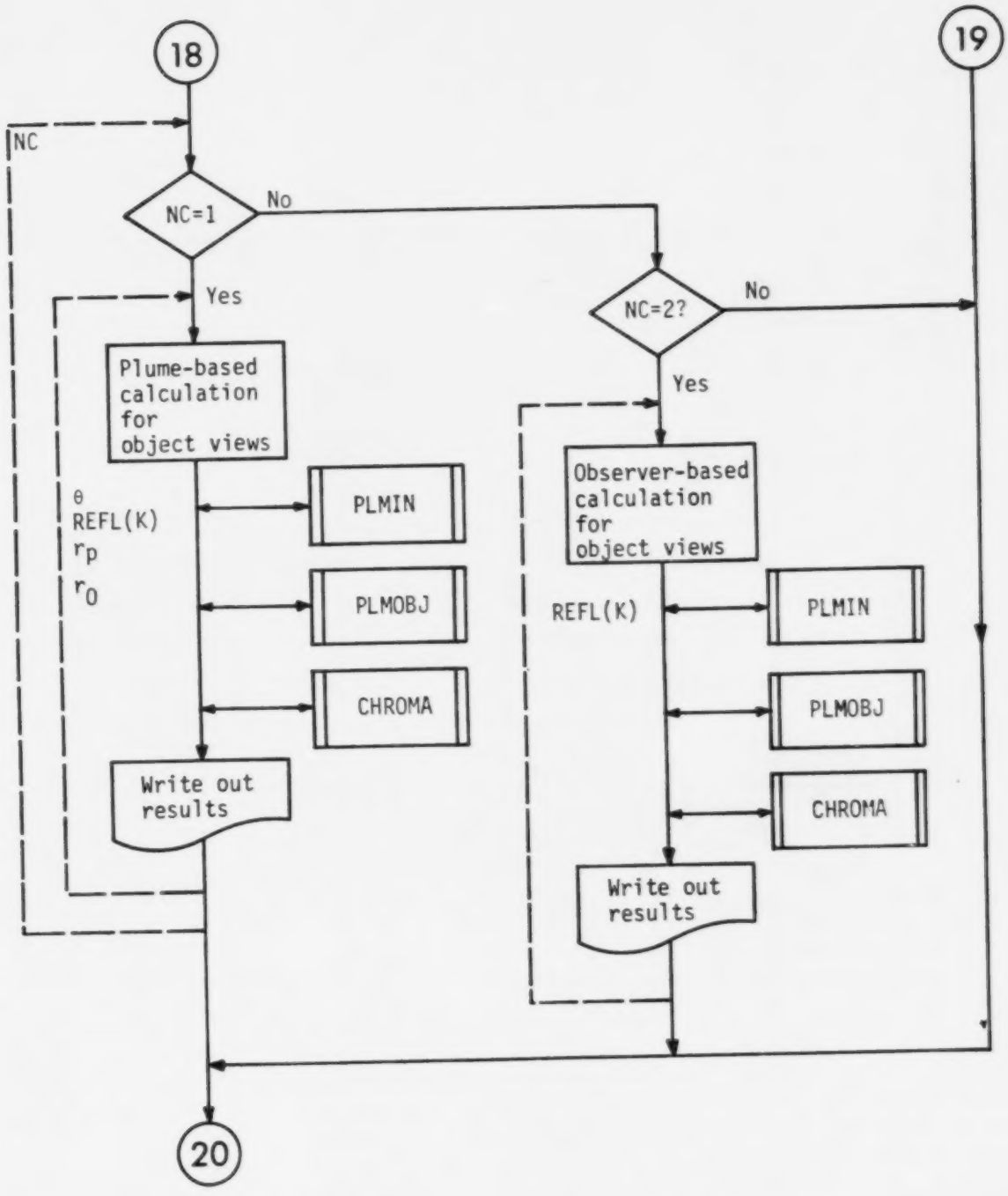


Figure 15(c) (continued)

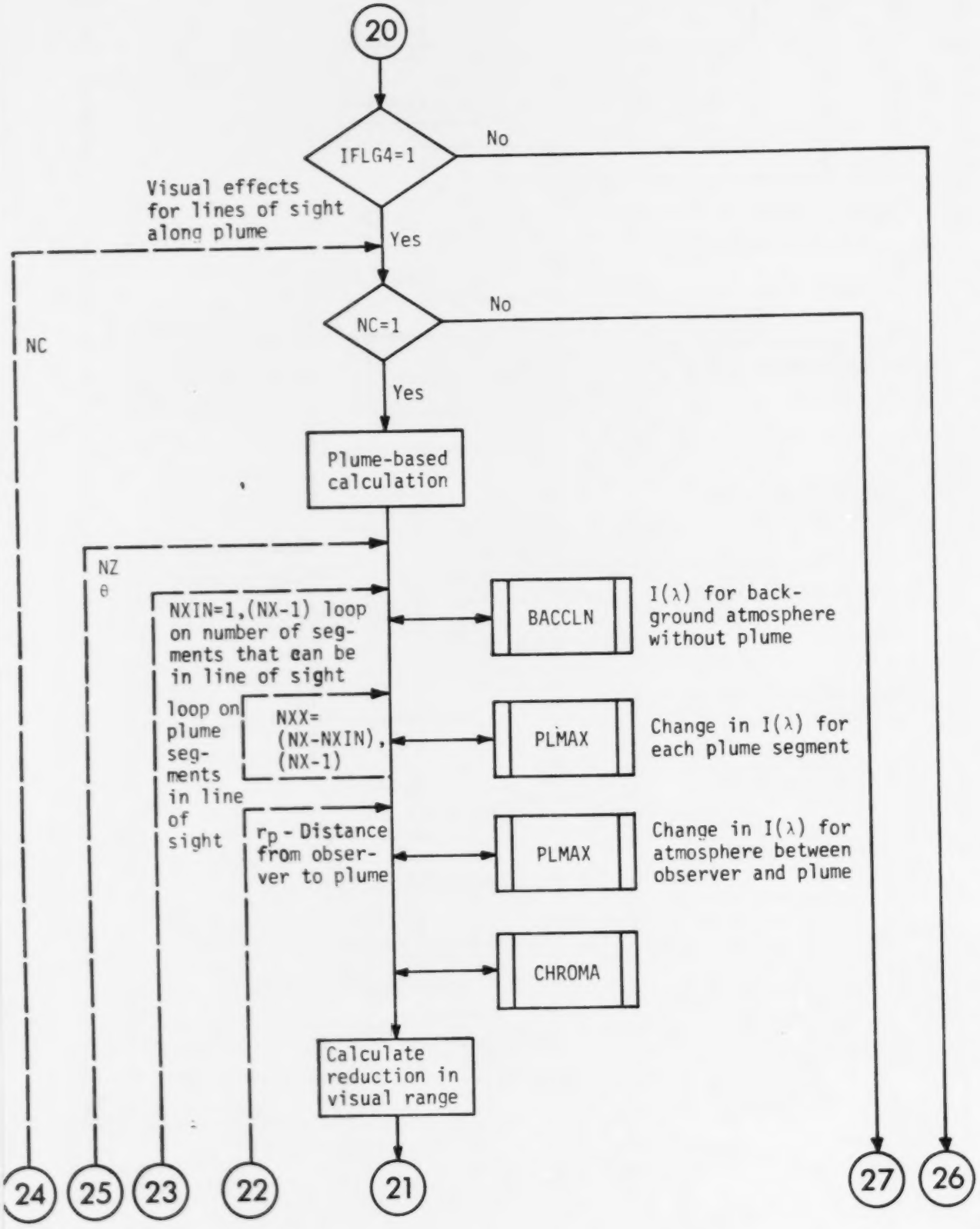


Figure 15(c) (continued)

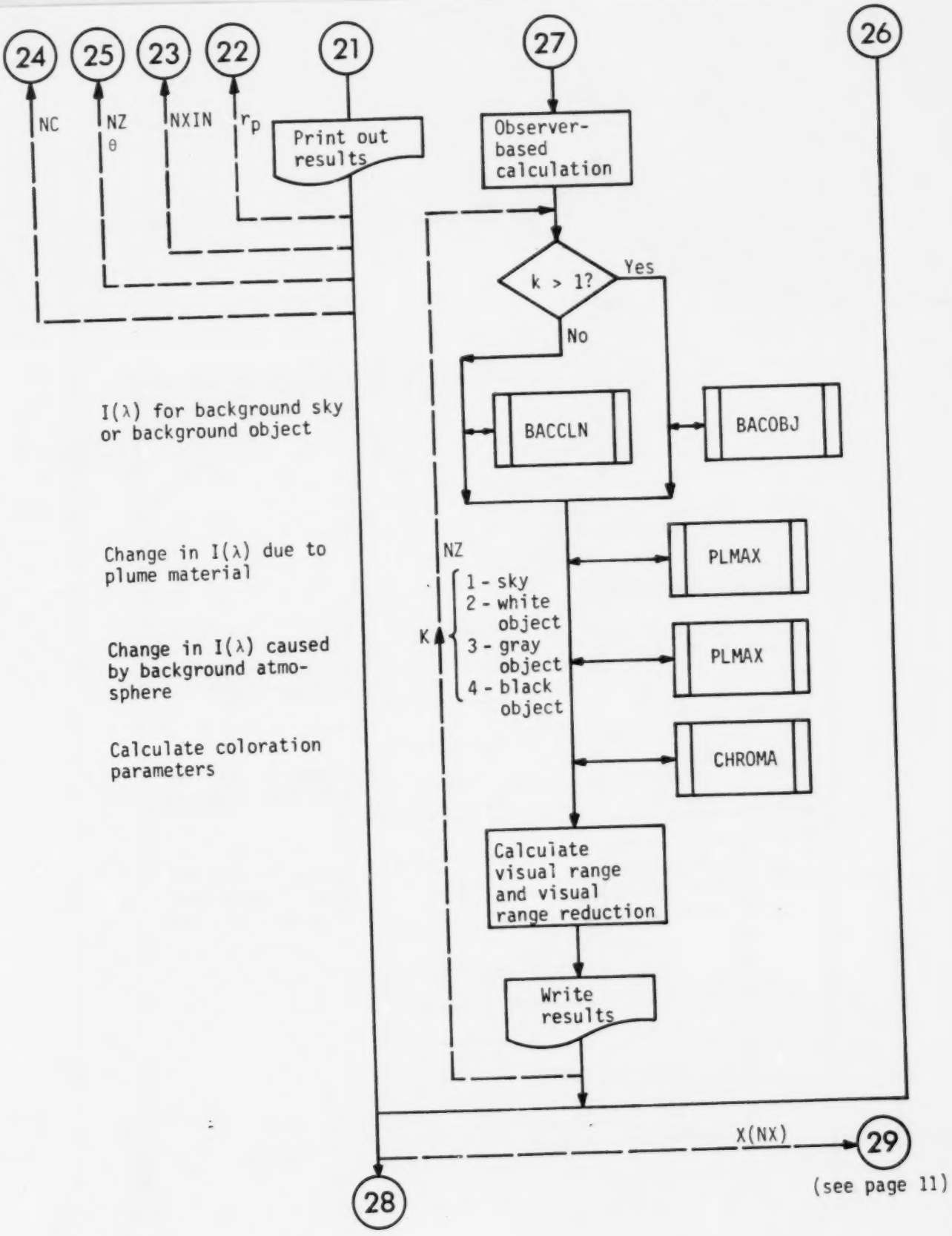


Figure 15(c) (continued)

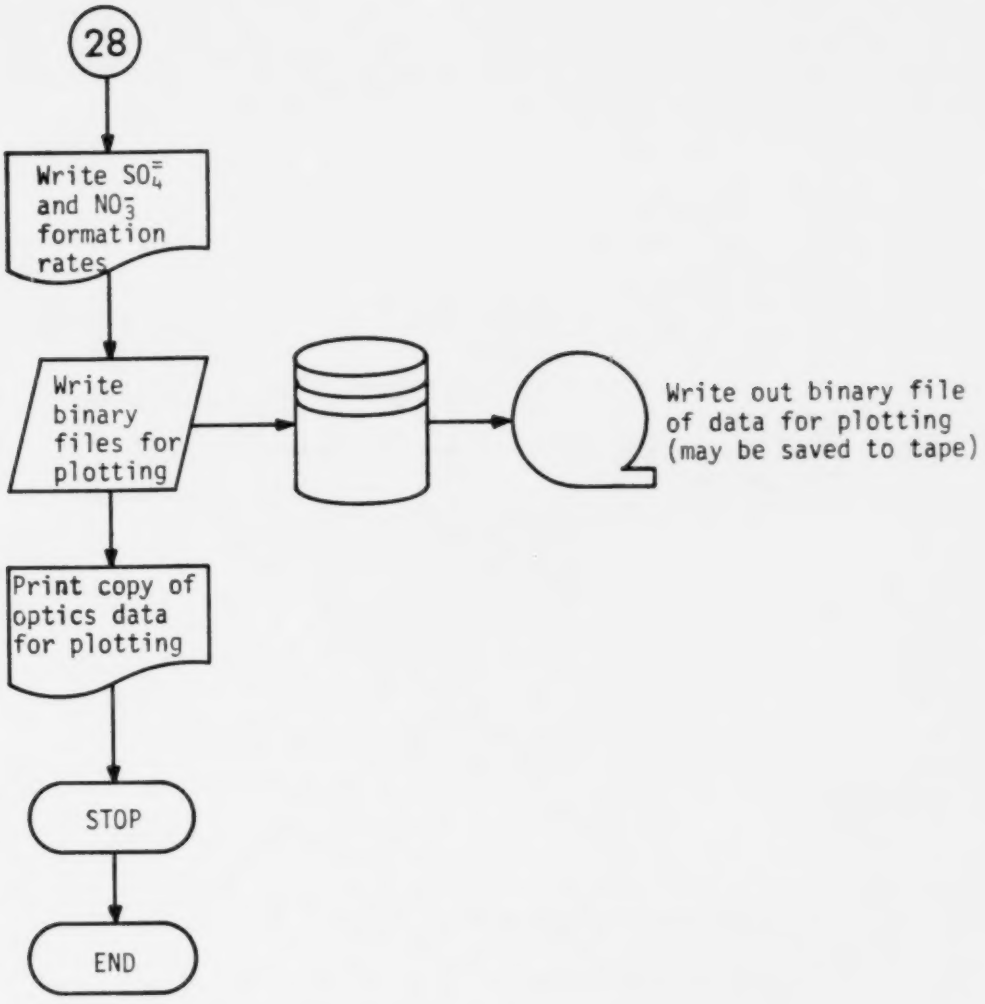
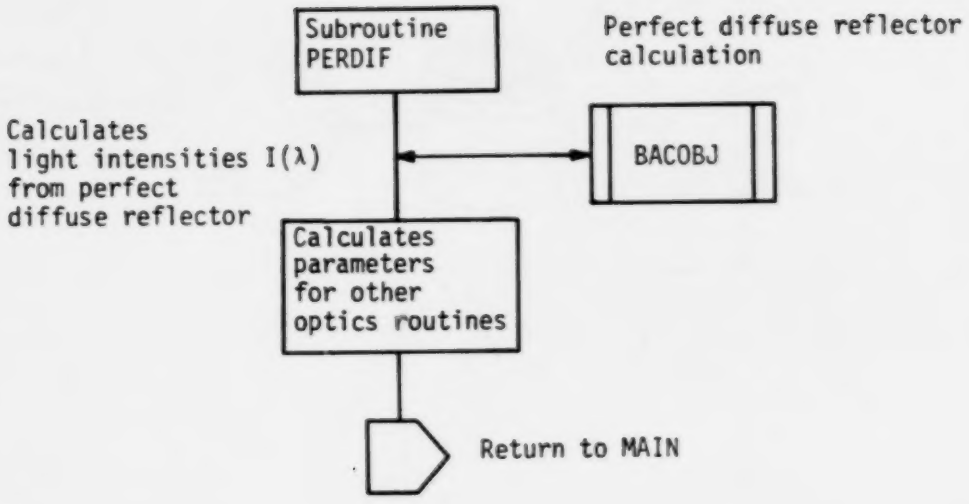
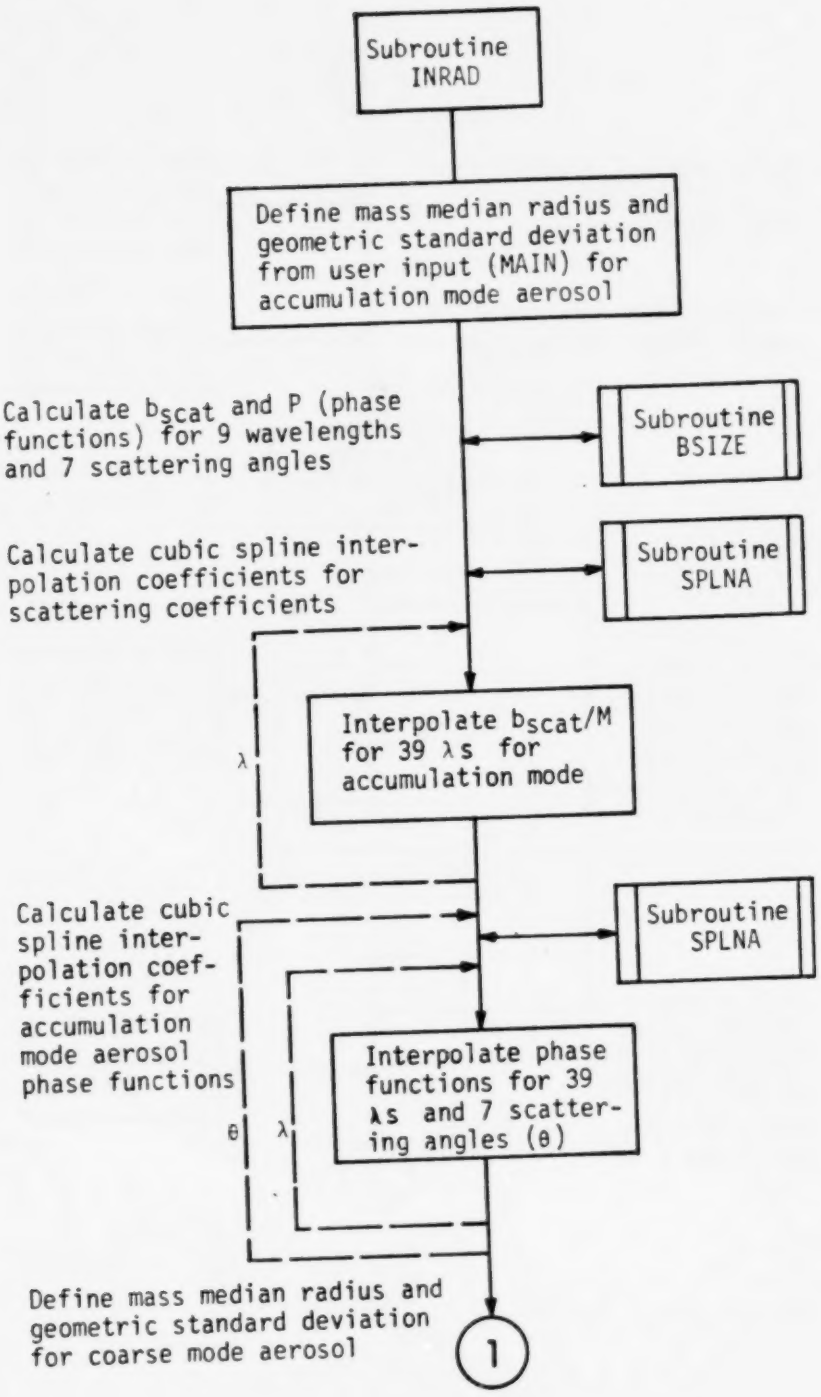


Figure 15(c) (concluded)



(d) Flow chart of subroutine PERDIF.

Figure 15 (continued)



(e) Flow chart of subroutine INRAD.

Figure 15 (continued)

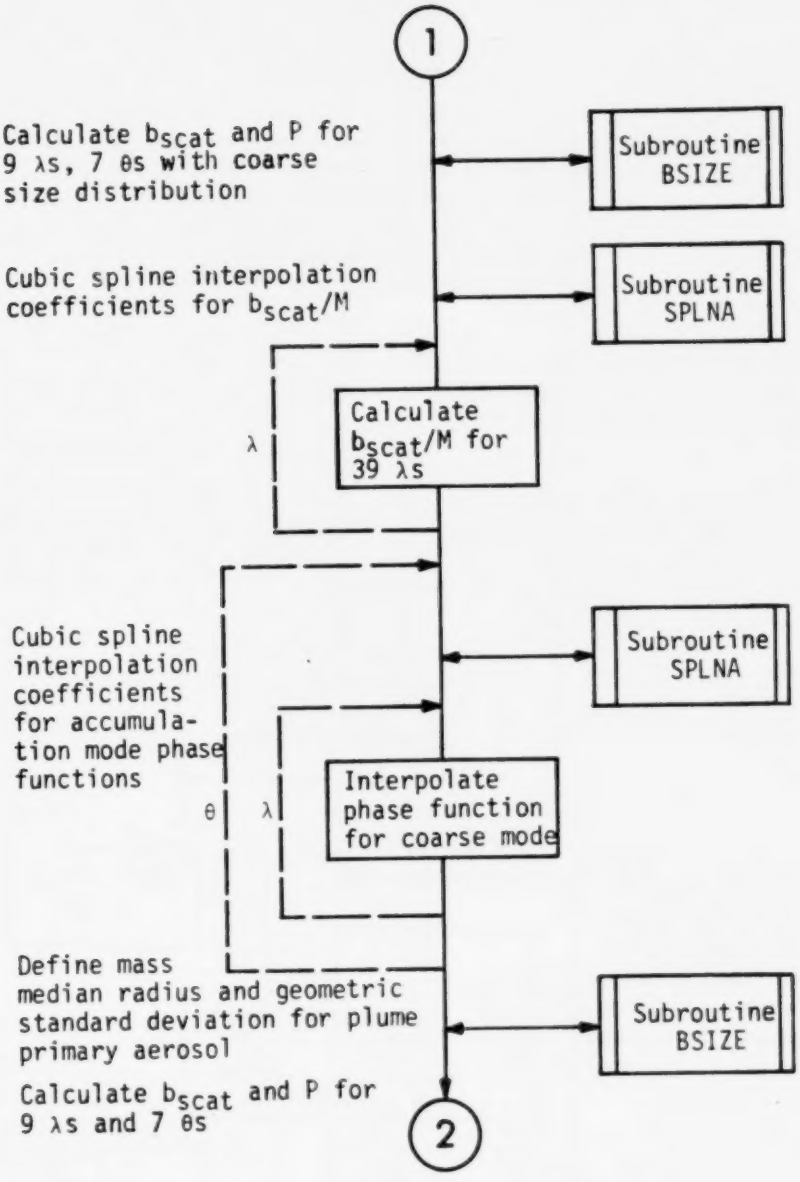


Figure 15(e) (continued)

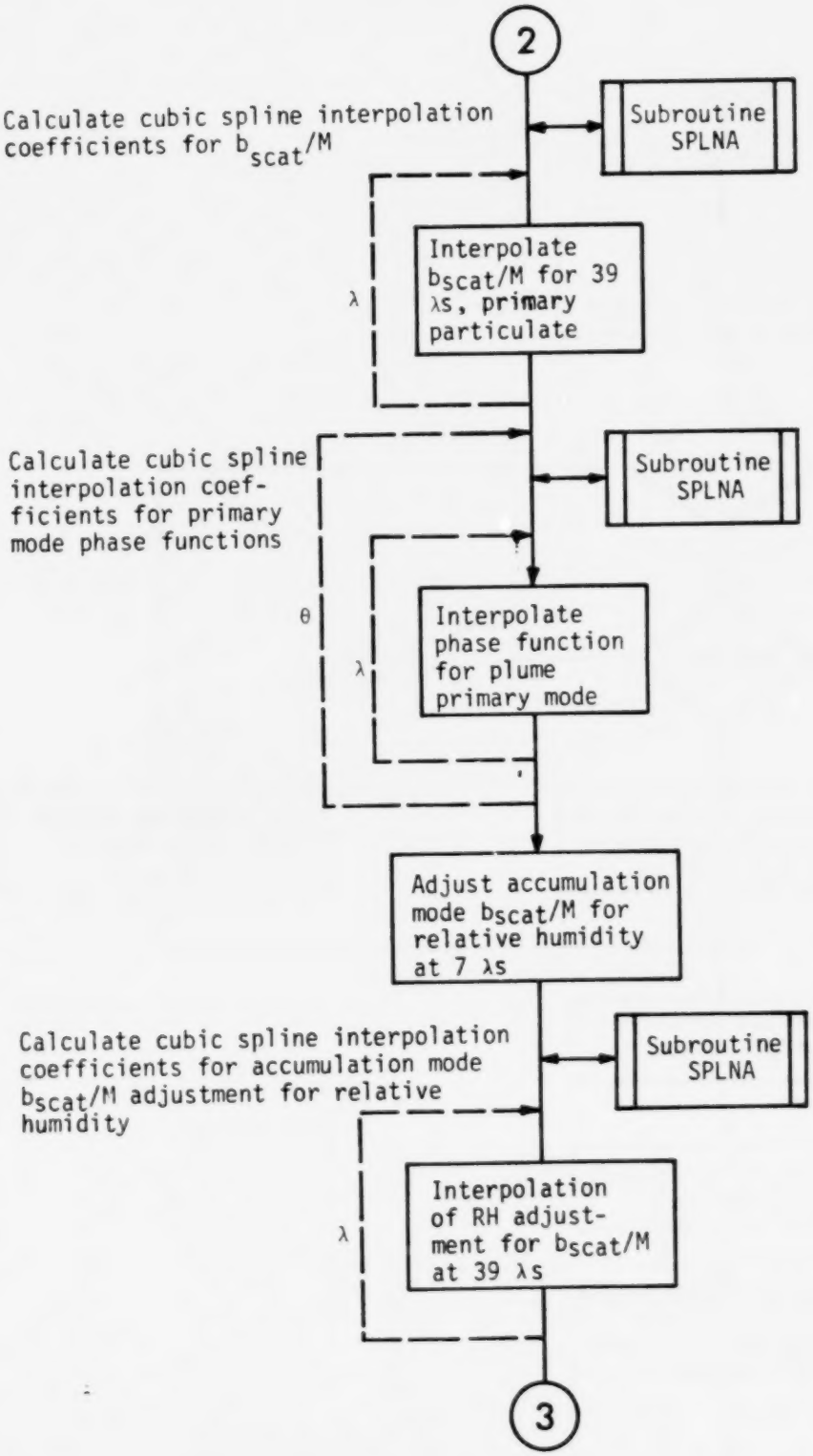


Figure 15(e) (continued)

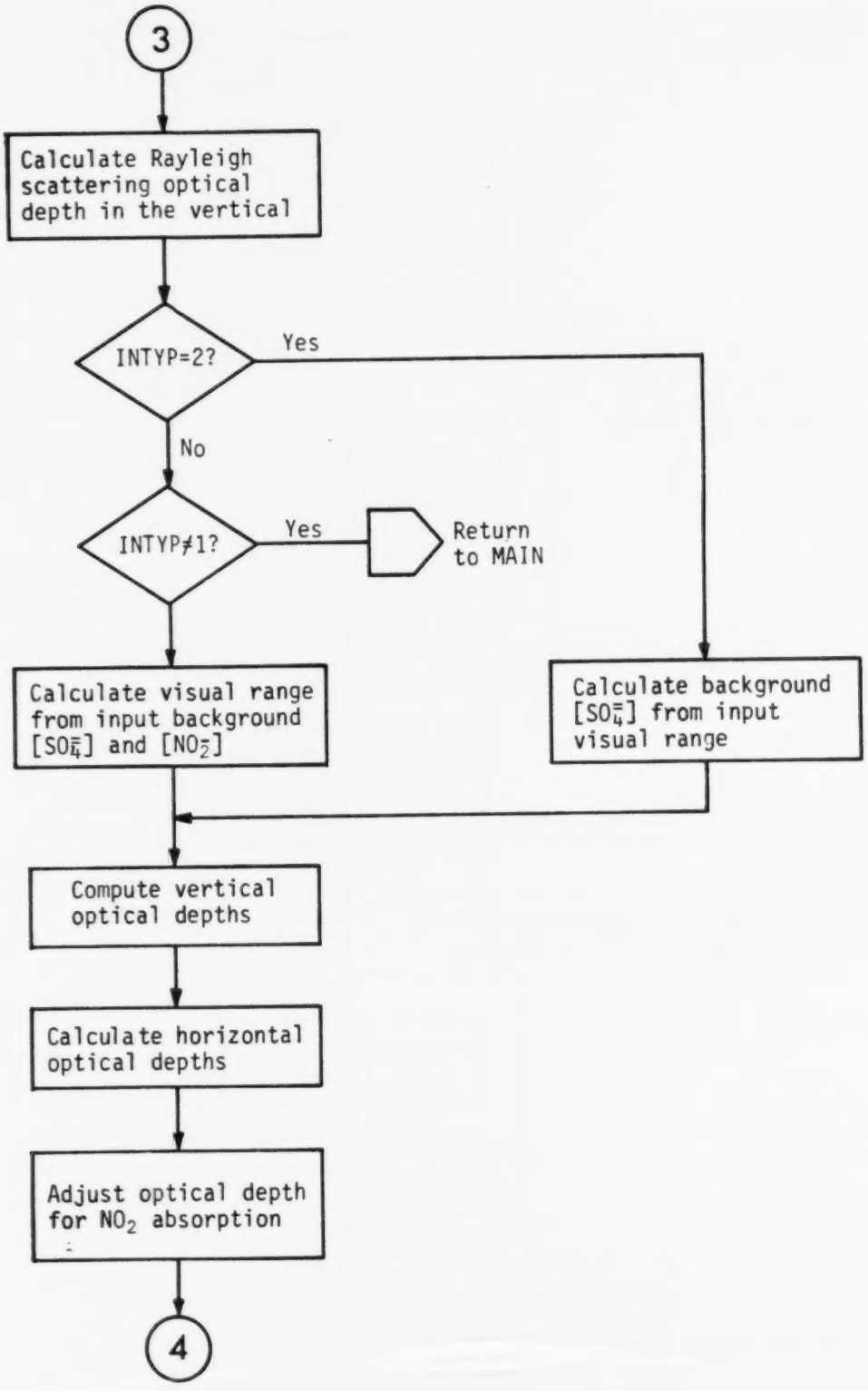


Figure 15(e)(continued)

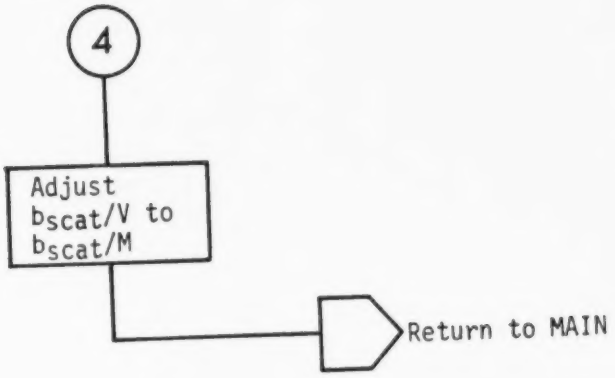
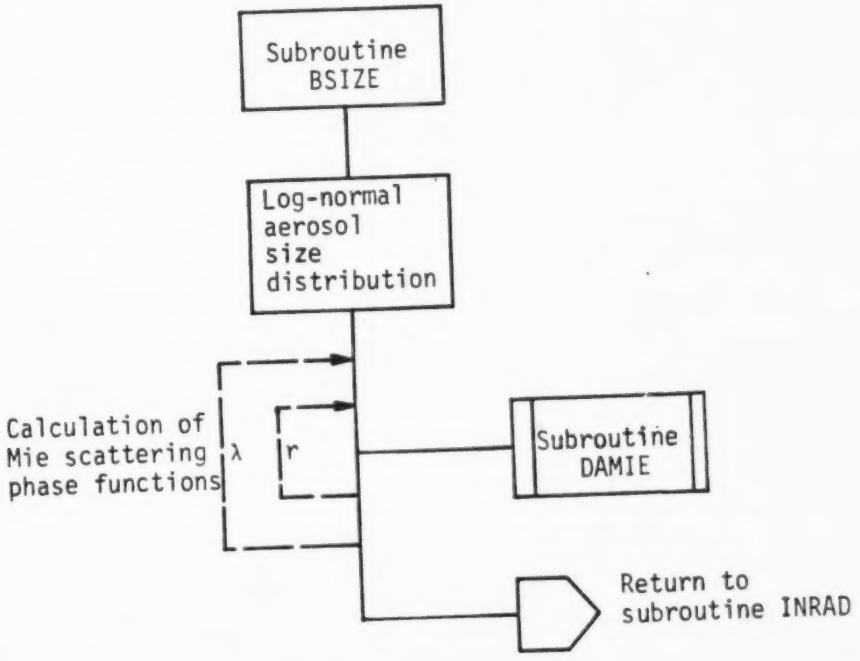


Figure 15(e) (concluded)



(f) Flow chart of subroutine BSIZE.

Figure 15 (concluded)

APPENDIX A

SAMPLE PLUVUE RUNS

Two sample runs were done to show how PLUVUE may be used in a particular case to execute the user's desired calculations. By selecting the proper values for control parameters in the input data file, the user can choose the needed subset from all the different optics calculations available.

The first sample is an observer-based run. Exhibit A-1 shows the input data file. The details of the formats and variables are given in chapter 3 on input data. This input data file specifies that the run will do observer-based optics calculations of all four types:

- Horizontal lines of sight through the plume (with a horizon sky background).
- Nonhorizontal lines of sight through the plume (with a sky background) if the elevation angle of the line of sight exceeds 5°.
- Horizontal lines of sight through the plume (with white, gray, and black backgrounds).
- Horizontal lines of sight at small angles to the plume centerline (with sky, white, gray, and black backgrounds).

The input data file also specifies flat terrain along the plume trajectory. The distance to background terrain is specified for every viewing azimuth at 15° intervals. The position of the plume trajectory is set by the 11.3 degree wind direction, and the position of the sun is set for 9:00 a.m. on 21 September 1979 at the source location. The observed points on the plume trajectory were chosen at 20 km intervals from 20 km

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```
1600 MW POWER PLANT
  4.5    5+0.00
 00517
 .        0.
 000.0
 5.
    0
 1 1 1 116 1 7 1
 1
 .         2.          5.          10.         20.         40.         60.         80.
 00.       120.        140.        160.        180.        200.        220.        240.
     37.50      131.80        4.90
 1555980.0       138.0         3.0        17.5
  4.0600.0
      45.0
      0.000      0.000       0.038      0.000
      0.125      2.750       0.125      0.850
      2.200      2.200       1.500      1.500
      1.800      2.000       1.800      2.000
     10.000
     2
     185.
 1.00 1.00 0.10 0.10
      0
 0.5
     2    2
     469.3      4254.8      6800.0
     498.9      4338.5      5650.0
    12    9    210900.    7. 1979
       0.0        0.0         0.0        0.0         0.0         0.0         0.0         0.0
       0.0        0.0         0.0        0.0         0.0         0.0         0.0         0.0
       0.0        0.0         0.0        185.        152.        149.        54.         185.
     145.0      111.         90.        50.         75.         100.        120.        140.
     185.0      150.        100.        185.        185.        185.        185.        185.
     160.0      185.        185.
      11.3
```

Exhibit A-1. Input data file for observer-based calculations.

to 240 km. Near the source, the observed points were chosen at 1, 2, 5, and 10 km. PLUVUE requires that the first point be at 1 km, to match the result of the initial plume rise calculation. The observed points at 2, 5, and 10 km were used to maintain the accuracy of the plume chemistry calculations, since the reaction rates are calculated at these observed points and are constant over the intervals from one point to the next.

Exhibit A-2 presents the beginning of the printed output, through the visual effects tables of the second observed point on the plume. The table for the initial plume rise calculations was printed because the value of the input variable IDILU was set for this condition. The table for nonhorizontal sight paths was not printed for the first two observed points because the elevation angle did not exceed 5° for either line of sight.

Exhibit A-3 is the printed output from this same observer-based PLUVUE run, for points at 100 and 120 km from the emissions source.

Exhibit A-4 shows the printed results for the final two observed points at 220 and 240 km. Figure A-4 also includes the tables of the history of the secondary aerosol formation. At the end of the printed output, the final table verifies the values of the data written on Fortran unit 7. This data is used by VISPLOT to generate plots of the key plume perceptibility and visual range reduction parameters.

Exhibit A-5 presents the input data file for the second sample PLUVUE execution. The principal difference between the first sample and the second sample is that the first is an observer-based run and the second is a plume-based run. The second sample starts with the same stability as the first sample; however, at the fourteenth downwind distance (200 km from the source) the stability changes from a Pasquill-Gifford E to a Pasquill-Gifford D. Both samples have a mixed layer height of 1000 m and a relative humidity of 45 percent. The background visual range (185 km) and ambient temperature (45°F) at the stack height (600 ft) are the same for both samples. The emissions data and aerosol size distribution data are also the same for both cases. For the 16 observed points on the plume trajectory, the second case uses the same distances from the source as the

```
VISUAL IMPACT ASSESSMENT FOR 1600 MW POWER PLANT
    EMISSIONS SOURCE DATA
        ELEVATION OF SITE =        5650.  FEET MSL
                                   1722.  METERS MSL
        NO. OF UNITS =      4.
        STACK HEIGHT =  600.  FEET
                        183.  METERS
        FLUE GAS FLOW RATE =    1555930.  CU FT/MIN
                                 734.23  CU M/SEC
        FLUE GAS TEMPERATURE =        138.  F
                                      332.  K
        FLUE GAS OXYGEN CONTENT =         3.0  MOL PERCENT
        SO2 EMISSION RATE (TOTAL) =       37.50  TONS/DAY
                                       3.937E 02  G/SEC
        NOX EMISSION RATE (TOTAL,AS NO2) =      131.39  TONS/DAY
                                                1.384E 03  G/SEC
        PARTICULATE EMISSION RATE (TOTAL) =        4.90  TONS/DAY
                                                5.145E 01  G/SEC


    METEOROLOGICAL AND AMBIENT AIR QUALITY DATA
        WINDSPEED =    4.5  MILES/HR
                       2.0  M/SEC
        PASQUILL-GIFFORD-TURNER STABILITY CATEGORY E
        LAPSE RATE =  0.00  F/1000 FT
                      0.000E-01  K/M
        POTENTIAL TEMPERATURE LAPSE RATE =     9.800E-03  K/M
        AMBIENT TEMPERATURE =  45.0  F
                              280.4  K
        RELATIVE HUMIDITY =  45.0  %
        MIXING DEPTH = 1000.  M
        AMBIENT PRESSURE =  0.82  ATM
        BACKGROUND NOX CONCENTRATION =       0.000  PPM
        BACKGROUND NO2 CONCENTRATION =       0.000  PPM
        BACKGROUND OZONE CONCENTRATION =       0.038  PPM
        BACKGROUND SO2 CONCENTRATION =       0.000  PPM
        BACKGROUND COARSE MODE CONCENTRATION =        10.0  UG/M3
        BACKGROUND SULFATE CONCENTRATION =         2.9  UG/M3
        BACKGROUND NITRATE CONCENTRATION =         0.0  UG/M3
        BACKGROUND VISUAL RANGE =       185.0  KILOMETERS
        SO2 DEPOSITION VELOCITY =        1.00  CM/SEC
        NOX DEPOSITION VELOCITY =        1.00  CM/SEC
        COARSE PARTICULATE DEPOSITION VELOCITY =        0.10  CM/SEC
        SUBMICRON PARTICULATE DEPOSITION VELOCITY =        0.10  CM/SEC
                                  AEROSOL STATISTICS
                                BACKGROUND                                PLUME
                      ACCUMULATION          COARSE          ACCUMULATION          COARSE
        MASS MEDIAN       MODE                MODE              MODE                MODE
        RADIUS
        MICROMETERS        0.125              2.750             0.125               0.850
        GEOMETRIC
        STANDARD
        DEVIATION          2.200              2.200             1.500               1.500
        PARTICLE
        DENSITY
        G/(CM**3)          1.800              2.000             1.800               2.000
```

Exhibit A-2. Beginning of printed results of PLUVUE observer-based calculations.

GEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIENTATION
WIND DIRECTION (DEGREES) = 11.3
SIMULATION IS FOR 900. HOURS ON 9/21
SOLAR ZENITH ANGLE (DEGREES) = 51.0
SOLAR AZIMUTH ANGLE (DEGREES) = 129.0
GEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELS AT GIVEN DOWNWIND DISTANCES (X)

X (KM)	AZIMUTH	RP	ALPHA	BETA	THETA
1.0	19.6	87.8	8.3	0.0	105.0
2.0	19.7	86.8	8.4	0.0	104.9
5.0	20.0	83.8	8.7	0.0	104.7
10.0	20.5	78.9	9.2	0.0	104.3
20.0	21.8	69.0	10.5	0.0	103.3
40.0	26.1	49.5	14.8	0.0	100.0
60.0	35.7	30.6	24.4	0.1	92.6
80.0	69.3	14.9	58.0	0.2	66.8
100.0	145.1	17.3	46.2	0.1	41.5
120.0	169.8	34.3	21.5	0.1	53.9
140.0	177.7	53.6	13.6	0.0	59.1
160.0	181.4	73.2	9.9	0.0	61.6
180.0	183.5	93.0	7.8	0.0	63.1
200.0	184.9	112.8	6.4	0.0	64.1
220.0	185.8	132.7	5.5	0.0	64.8
240.0	186.6	152.6	4.7	0.0	65.3

BACKGROUND CONDITIONS

ACCUMULATION MODE			COARSE PARTICLE MODE			PRIMARY PARTICLE MODE		
MASS RADIUS	SIGMA	BSCAT.55/MASS	MASS RADIUS	SIGMA	BSCAT.55/MASS	MASS RADIUS	SIGMA	BSCAT.55/MASS
0.1230E 00	0.2200E 01	0.2844E-02	0.2750E 01	0.2200E 01	0.4469E-03	0.8500E 00	0.1500E 01	0.1242E-02

COEFFICIENTS AT 0.55 MICROMETERS , 1./KM

BTARAY =0.9747E-02 BTAAER =0.1282E-01 ABSNO2 =0.0000E 00 BTABAC =0.2115E-01

Exhibit A-2 (continued)

INITIAL PLUME RISE AND DILUTION AND NITROGEN DIOXIDE FORMATION
1000 MW POWER PLANT

TIME (SEC)	X (M)	DELTA H (M)	U (M/S)	W (M/S)	V (M/S)	SIGMA (M)	TEMP (K)	O2 MOL F	NO2-NO RATIO EQUIL	NO2-NO RATIO ACTUAL	NOX (PPM)	NO (PPM)	NO2T (PPM)	SO2 (PPM)	PARTICULATE UG/M3
0.	0.0	0.0	2.01	17.50	17.50	0.0	332.0	3.0	5.9E 04	4.2E-03	340.166	338.750	1.416	69.579	2.3FE 04
10.	20.1	31.6	2.01	1.00	2.25	7.3	329.9	3.8	7.2E 04	6.2E-03	325.892	323.893	1.999	66.660	2.2EE 04
20.	40.2	50.2	2.01	0.89	2.17	11.7	298.8	14.5	5.8E 05	8.6E-03	121.423	120.390	1.033	24.836	8.49E 03
30.	60.3	65.7	2.01	0.71	2.13	15.3	291.0	17.3	9.0E 05	1.3E-02	69.976	69.100	0.876	14.313	4.89E 03
40.	80.5	79.6	2.01	0.64	2.11	18.5	287.6	18.4	1.1E 06	1.6E-02	47.571	46.841	0.730	9.730	3.33E 03
50.	100.6	92.4	2.01	0.60	2.10	21.5	285.7	19.1	1.2E 06	1.8E-02	35.323	34.706	0.616	7.225	2.47E 03
60.	120.7	104.3	2.01	0.56	2.09	24.3	284.6	19.5	1.3E 06	1.9E-02	27.715	27.186	0.528	5.669	1.94E 03
70.	140.8	115.6	2.01	0.54	2.08	26.9	283.8	19.8	1.3E 06	2.1E-02	22.583	22.123	0.460	4.619	1.58E 03
80.	160.9	126.4	2.01	0.51	2.08	29.4	283.2	19.9	1.4E 06	2.2E-02	18.916	18.510	0.406	3.869	1.32E 03
90.	181.0	136.7	2.01	0.49	2.07	31.8	282.8	20.1	1.4E 06	2.3E-02	16.169	15.818	0.352	3.309	1.13E 03
100.	201.1	146.7	2.01	0.48	2.07	34.1	282.5	20.2	1.4E 06	2.4E-02	14.070	13.765	0.305	2.879	9.84E 02
110.	221.3	156.3	2.01	0.46	2.06	36.3	282.3	20.3	1.5E 06	2.4E-02	12.490	12.105	0.285	2.556	8.67E 02
120.	241.4	165.6	2.01	0.45	2.06	38.5	282.1	20.4	1.5E 06	2.5E-02	11.069	10.779	0.270	2.290	7.78E 02
130.	261.5	174.7	2.01	0.44	2.06	40.6	281.9	20.4	1.5E 06	2.6E-02	9.937	9.639	0.248	2.083	6.95E 02
140.	281.6	183.6	2.01	0.43	2.06	42.7	281.7	20.5	1.5E 06	2.6E-02	9.007	8.773	0.229	1.842	6.30E 02
150.	301.7	192.2	2.01	0.42	2.05	44.7	281.6	20.5	1.5E 06	2.7E-02	8.220	8.007	0.213	1.637	5.75E 02
160.	321.8	200.6	2.01	0.41	2.05	46.7	281.5	20.5	1.5E 06	2.7E-02	7.546	7.347	0.198	1.553	5.28E 02
170.	342.0	208.7	2.01	0.40	2.05	48.5	281.4	20.6	1.5E 06	2.7E-02	6.977	6.791	0.186	1.497	4.88E 02
180.	362.1	208.7	2.01	0.39	2.05	48.5	281.4	20.6	1.5E 06	2.8E-02	6.902	6.794	0.169	1.454	4.53E 02
190.	382.2	208.7	2.01	0.39	2.05	48.5	281.4	20.6	1.5E 06	2.8E-02	6.987	6.796	0.191	1.499	4.82E 02
200.	402.3	208.7	2.01	0.38	2.05	48.5	281.4	20.6	1.5E 06	2.8E-02	6.991	6.797	0.194	1.499	4.89E 02
210.	422.4	208.7	2.01	0.37	2.05	48.5	281.4	20.6	1.5E 06	2.9E-02	6.995	6.798	0.196	1.431	4.92E 02
220.	442.5	208.7	2.01	0.37	2.04	48.5	281.4	20.6	1.5E 06	2.9E-02	6.998	6.799	0.199	1.431	4.90E 02
230.	462.6	208.7	2.01	0.36	2.04	48.5	281.4	20.6	1.5E 06	3.0E-02	7.001	6.800	0.201	1.432	4.90E 02
240.	482.8	208.7	2.01	0.36	2.04	48.5	281.4	20.6	1.5E 06	3.0E-02	7.005	6.801	0.204	1.433	4.90E 02
250.	502.9	208.7	2.01	0.35	2.04	48.5	281.4	20.6	1.5E 06	3.0E-02	7.007	6.801	0.206	1.433	4.90E 02
260.	523.0	208.7	2.01	0.35	2.04	48.5	281.4	20.6	1.5E 06	3.1E-02	7.010	6.801	0.209	1.434	4.90E 02
270.	543.1	208.7	2.01	0.34	2.04	48.5	281.4	20.6	1.5E 06	3.1E-02	7.013	6.801	0.211	1.434	4.91E 02
280.	563.2	208.7	2.01	0.34	2.04	48.5	281.4	20.6	1.5E 06	3.1E-02	7.015	6.801	0.214	1.435	4.91E 02
290.	583.3	208.7	2.01	0.33	2.04	48.5	281.4	20.6	1.5E 06	3.2E-02	7.017	6.801	0.216	1.435	4.91E 02
300.	603.4	208.7	2.01	0.33	2.04	48.5	281.4	20.6	1.5E 06	3.2E-02	7.019	6.801	0.219	1.436	4.91E 02
310.	623.6	208.7	2.01	0.33	2.04	48.5	281.4	20.6	1.5E 06	3.3E-02	7.021	6.800	0.221	1.436	4.91E 02
320.	643.7	208.7	2.01	0.32	2.04	48.5	281.4	20.6	1.5E 06	3.3E-02	7.023	6.800	0.224	1.437	4.91E 02
330.	663.8	208.7	2.01	0.32	2.04	48.5	281.4	20.6	1.5E 06	3.3E-02	7.025	6.799	0.226	1.437	4.91E 02
340.	683.9	208.7	2.01	0.32	2.04	48.5	281.4	20.6	1.5E 06	3.4E-02	7.027	6.798	0.228	1.437	4.92E 02
350.	704.0	208.7	2.01	0.31	2.04	48.5	281.4	20.6	1.5E 06	3.4E-02	7.028	6.797	0.231	1.438	4.92E 02
360.	724.1	208.7	2.01	0.31	2.04	48.5	281.4	20.6	1.5E 06	3.4E-02	7.030	6.797	0.233	1.438	4.92E 02
370.	744.3	208.7	2.01	0.31	2.04	48.5	281.4	20.6	1.5E 06	3.5E-02	7.031	6.796	0.236	1.438	4.92E 02
380.	764.4	208.7	2.01	0.31	2.03	48.5	281.4	20.6	1.5E 06	3.5E-02	7.033	6.795	0.238	1.439	4.92E 02
390.	784.5	208.7	2.01	0.30	2.03	48.5	281.4	20.6	1.5E 06	3.5E-02	7.034	6.794	0.241	1.439	4.92E 02
400.	804.6	208.7	2.01	0.30	2.03	48.5	281.4	20.6	1.5E 06	3.6E-02	7.036	6.792	0.243	1.439	4.92E 02
410.	824.7	208.7	2.01	0.30	2.03	48.5	281.4	20.6	1.5E 06	3.6E-02	7.037	6.791	0.246	1.439	4.92E 02
420.	844.8	208.7	2.01	0.30	2.03	48.5	281.4	20.6	1.5E 06	3.7E-02	7.038	6.790	0.248	1.440	4.92E 02
430.	864.9	208.7	2.01	0.29	2.03	48.5	281.4	20.6	1.5E 06	3.7E-02	7.039	6.789	0.250	1.440	4.92E 02
440.	885.1	208.7	2.01	0.29	2.03	48.5	281.4	20.6	1.5E 06	3.7E-02	7.040	6.787	0.253	1.440	4.92E 02
450.	905.2	208.7	2.01	0.29	2.03	48.5	281.4	20.6	1.5E 06	3.8E-02	7.041	6.786	0.255	1.440	4.93E 02
460.	925.3	208.7	2.01	0.29	2.03	48.5	281.4	20.6	1.5E 06	3.8E-02	7.042	6.785	0.258	1.440	4.93E 02
470.	945.4	208.7	2.01	0.29	2.03	48.5	281.4	20.6	1.5E 06	3.8E-02	7.043	6.783	0.260	1.441	4.93E 02
480.	965.5	208.7	2.01	0.28	2.03	48.5	281.4	20.6	1.5E 06	3.9E-02	7.044	6.782	0.262	1.441	4.93E 02
490.	985.6	208.7	2.01	0.28	2.03	48.5	281.4	20.6	1.5E 06	3.9E-02	7.045	6.780	0.265	1.441	4.93E 02

Exhibit A-2 (continued)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 79.
SIGMA Z (M) = 29.
SO2-SO4 CONVERSION RATE= 0.5000 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0000 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY BSP-TOTAL (UG/M3)	(10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	3.904	0.185	0.000	4.751	0.000	0.798	2.165	0.069	-0.037	273.036	3.454	1.782
TOTAL AMB!	3.904	0.185	0.000	4.751	0.000	0.798	5.101	0.163	0.091	286.022	3.583	4.050
H+1S												
INCREMENT!	17.497	0.701	0.000	4.008	0.000	3.576	9.701	0.069	-0.037	1223.884	15.481	1.782
TOTAL AMB!	17.497	0.701	0.000	4.008	0.000	3.576	12.637	0.090	0.001	1236.820	15.610	2.808
H												
INCREMENT!	28.848	1.132	0.000	3.923	0.000	5.897	15.994	0.069	-0.037	2017.842	25.524	1.782
TOTAL AMB!	28.848	1.132	0.000	3.923	0.000	5.897	18.930	0.082	0.001	2030.778	25.653	2.099
H-1S												
INCREMENT!	17.497	0.701	0.000	4.008	0.000	3.576	9.701	0.069	-0.037	1223.881	15.481	1.782
TOTAL AMB!	17.497	0.701	0.000	4.008	0.000	3.576	12.637	0.090	0.001	1236.817	15.610	2.808
H-2S												
INCREMENT!	3.904	0.185	0.000	4.751	0.000	0.798	2.165	0.069	-0.037	273.035	3.454	1.782
TOTAL AMB!	3.904	0.185	0.000	4.751	0.000	0.798	5.101	0.163	0.091	286.021	3.583	4.050
0												
INCREMENT!	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.069	0.000	0.000	0.000	1.782
TOTAL AMB!	0.000	0.000	0.000	100.000	0.000	0.000	2.936	100.000	0.033	12.936	0.123	65.142

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 392.
PLUME-OBSERVER DISTANCE (KM) = 87.8
AZIMUTH OF LINE-OF-SIGHT = 19.6
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RVO	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
105.																
	8.	0.47	87.8	52.53	55.02	79.07	0.2972	0.3075	-3.12	-1.76	-0.0569	1.0220	-0.0020	-0.0037	2.6904	2.311

Exhibit A-2 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME-OBSERVER DISTANCE (KM) = 87.8
AZIMUTH OF LINE-OF-SIGHT = 19.6
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
THETA = 105.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.47	0.73	55.07	79.10	0.2974	0.3076	-5.76	-3.20	-0.0333	1.2593	-0.0101	-0.0074	7.3962	5.0607
0.3	0.47	0.73	54.93	79.05	0.2971	0.3075	-1.36	-0.78	-0.0262	0.9962	0.0004	-0.0010	1.1492	1.0053
0.0	0.47	0.73	54.95	79.03	0.2970	0.3074	0.53	0.30	0.0031	0.8324	0.0053	0.0020	3.6321	2.1368

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME-OBSERVER DISTANCE (KM) = 87.8
AZIMUTH OF LINE-OF-SIGHT = 19.6
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV %REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
105.															
FOR SKY BACKGROUND:															
	1.	0.47	88.1	52.40	55.02	79.07	0.2972	0.3075	-3.08	-1.74	-0.0544	1.0498	-0.0027	-0.0036	2.7135	2.246
FOR WHITE BACKGROUND:															
	1.	0.47	88.1	52.40	55.07	79.10	0.2974	0.3076	-5.92	-3.29	-0.0903	1.2656	-0.0104	-0.0076	7.6047	5.201
FOR GRAY BACKGROUND:															
	1.	0.47	88.1	52.41	54.98	79.05	0.2971	0.3075	-1.41	-0.80	-0.0270	0.9983	0.0003	-0.0010	1.1478	1.020
FOR BLACK BACKGROUND:															
	1.	0.47	88.0	52.41	54.95	79.03	0.2970	0.3074	0.53	0.30	0.0031	0.8326	0.0053	0.0020	3.6251	2.131

Exhibit A-2 (continued)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 123.
SIGMA Z (M) = 39.
SO2-SO4 CONVERSION RATE= 0.5000 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0000 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	1.068	0.125	0.000	6.711	0.000	0.382	2.071	0.138	-0.037	130.686	1.683	3.501
TOTAL AMB!	1.068	0.125	0.000	6.711	0.000	0.382	5.007	0.333	0.001	143.622	1.811	7.865
H+1S												
INCREMENT!	8.373	0.695	0.000	8.303	0.000	1.710	9.282	0.138	-0.037	585.694	7.541	3.501
TOTAL AMB!	8.373	0.695	0.000	8.303	0.000	1.710	12.218	0.182	0.001	598.630	7.669	4.532
H												
INCREMENT!	13.605	1.462	0.000	10.593	0.000	2.820	15.303	0.138	-0.037	965.645	12.432	3.501
TOTAL AMB!	13.605	1.462	0.000	10.593	0.000	2.820	18.239	0.164	0.001	978.581	12.561	4.130
H-1S												
INCREMENT!	8.373	0.695	0.000	8.303	0.000	1.710	9.282	0.138	-0.037	585.693	7.541	3.501
TOTAL AMB!	8.373	0.695	0.000	8.303	0.000	1.710	12.218	0.182	0.001	598.629	7.669	4.532
H-2S												
INCREMENT!	1.068	0.125	0.000	6.711	0.000	0.382	2.071	0.138	-0.037	130.686	1.683	3.501
TOTAL AMB!	1.068	0.125	0.000	6.711	0.000	0.382	5.007	0.333	0.001	143.622	1.811	7.865
0												
INCREMENT!	0.000	0.000	0.000	0.000	1.607	0.000	0.000	0.367	0.000	0.000	0.000	0.007
TOTAL AMB!	0.000	0.000	0.000	98.393	1.607	0.000	2.936	100.000	0.038	12.936	0.128	65.142

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-2 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
PLUME ALTITUDE (M) = 392.
PLUME-OBSERVER DISTANCE (KM) = 86.8
AZIMUTH OF LINE-OF-SIGHT = 19.7
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
105.																
	8.	0.47	87.1	52.94	54.37	78.70	0.2975	0.3069	-3.76	-2.13	-0.0697	1.0211	-0.0018	-0.0044	3.1943	2.814

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
PLUME-OBSERVER DISTANCE (KM) = 86.8
AZIMUTH OF LINE-OF-SIGHT = 19.7
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA =	105.														
REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.47	0.73	54.49	78.76	0.2980	0.3070	-6.35	-3.55	-0.1003	1.2482	-0.0096	-0.0080	7.3268	5.2321
0.3	0.47	0.73	54.31	78.66	0.2973	0.3068	-2.02	-1.16	-0.0397	0.9961	0.0006	-0.0017	1.8078	1.5751
0.0	0.47	0.73	54.24	78.62	0.2970	0.3066	-0.17	-0.10	-0.0111	0.8855	0.0053	0.0013	3.8030	2.2787

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
PLUME-OBSERVER DISTANCE (KM) = 86.8
AZIMUTH OF LINE-OF-SIGHT = 19.7
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
105.																
FOR SKY BACKGROUND:																
	2.	0.47	86.8	53.03	54.14	78.56	0.2975	0.3066	-3.95	-2.25	-0.0720	1.0479	-0.0024	-0.0046	3.3280	2.897
FOR WHITE BACKGROUND:																
	2.	0.47	86.8	53.07	54.25	78.63	0.2980	0.3067	-6.75	-3.77	-0.1071	1.2545	-0.0099	-0.0085	7.6437	5.507
FOR GRAY BACKGROUND:																
	2.	0.47	86.8	53.08	54.08	78.53	0.2973	0.3065	-2.30	-1.32	-0.0452	0.9982	0.0003	-0.0020	2.0299	1.765
FOR BLACK BACKGROUND:																
	2.	0.47	86.8	53.09	54.01	78.49	0.2971	0.3064	-0.39	-0.23	-0.0158	0.8856	0.0053	0.0010	3.8774	2.352

Exhibit A-2 (concluded)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 3015.
SIGMA Z (M) = 187.
SO2-SO4 CONVERSION RATE= 0.5035 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0243 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	0.016	0.011	0.000	68.962	0.601	0.003	0.820	6.830	-0.010	1.123	0.039	64.224
TOTAL AMB!	0.016	0.011	0.000	68.963	0.601	0.003	3.816	24.114	0.023	14.059	0.167	[illegible]
H+1S												
INCREMENT!	0.072	0.038	0.000	52.846	0.058	0.014	3.825	6.727	-0.024	5.031	0.173	63.873
TOTAL AMB!	0.072	0.038	0.000	52.846	0.058	0.014	6.821	11.239	0.014	17.967	0.301	[illegible]
H												
INCREMENT!	0.119	0.058	0.000	48.738	0.031	0.023	6.400	6.720	-0.026	8.296	0.235	63.848
TOTAL AMB!	0.119	0.058	0.000	48.738	0.031	0.023	9.336	9.510	0.012	21.232	0.413	[illegible]
H-1S												
INCREMENT!	0.073	0.038	0.000	52.659	0.058	0.014	3.924	6.727	-0.024	5.081	0.175	63.872
TOTAL AMB!	0.073	0.038	0.000	52.659	0.058	0.014	6.860	11.196	0.014	18.017	0.303	[illegible]
H-2S												
INCREMENT!	0.027	0.017	0.000	64.487	0.331	0.005	1.457	6.799	-0.015	1.869	0.065	[illegible]
TOTAL AMB!	0.027	0.017	0.000	64.483	0.331	0.005	4.392	18.012	0.023	14.894	[illegible]	[illegible]
0												
INCREMENT!	0.026	0.017	0.000	63.060	0.421	0.005	1.435	6.799	-0.017	1.839	0.064	64.117
TOTAL AMB!	0.026	0.017	0.000	63.061	0.421	0.005	4.371	18.179	0.021	14.775	[illegible]	[illegible]

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-3. Printed results of observer-based PLUVUE calculations for observed points at 100 and 120 km from the emissions source.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392.
PLUME-OBSERVER DISTANCE (KM) = 17.5
AZIMUTH OF LINE-OF-SIGHT = 145.1
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
42.																
	46.	0.09	165.3	10.64	104.22	101.61	0.3461	0.3520	-9.77	-3.56	-0.0844	0.7576	0.0224	0.0183	20.4989	13.021

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME-OBSERVER DISTANCE (KM) = 17.5
AZIMUTH OF LINE-OF-SIGHT = 145.1
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA = 42. REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.09	0.87	104.50	101.71	0.3472	0.3520	-9.86	-3.59	-0.0845	0.7662	0.0221	0.0182	20.1832	12.9453
0.3	0.09	0.87	102.76	101.05	0.3444	0.3510	-8.93	-3.29	-0.0782	0.7520	0.0223	0.0139	20.8979	13.1602
0.0	0.09	0.87	102.02	100.77	0.3432	0.3505	-8.53	-3.16	-0.0754	0.7453	0.0232	0.0193	21.2141	13.3026

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME-OBSERVER DISTANCE (KM) = 17.5
AZIMUTH OF LINE-OF-SIGHT = 145.1
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
42.																
FOR SKY BACKGROUND:																
	10.	0.09	165.8	10.38	105.25	101.99	0.3459	0.3523	-9.09	-3.30	-0.0772	0.7572	0.0216	0.0184	19.9524	12.717
FOR WHITE BACKGROUND:																
	10.	0.09	165.8	10.39	105.36	102.03	0.3466	0.3522	-9.11	-3.30	-0.0769	0.7631	0.0214	0.0183	19.7874	12.649
FOR GRAY BACKGROUND:																
	10.	0.09	165.5	10.57	103.53	101.36	0.3437	0.3512	-8.17	-3.00	-0.0703	0.7487	0.0222	0.0191	20.5127	12.973
FOR BLACK BACKGROUND:																
	10.	0.09	165.3	10.64	102.78	101.06	0.3425	0.3507	-7.77	-2.87	-0.0677	0.7420	0.0225	0.0194	20.8360	13.129

Exhibit A-3 (continued)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 3490.
SIGMA Z (M) = 195.
SO2-SO4 CONVERSION RATE= 0.3048 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0339 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	0.013	0.009	0.000	69.931	0.041	0.002	0.869	3.160	-0.003	0.923	0.036	63.100
TOTAL AMB!	0.013	0.009	0.000	69.931	0.041	0.002	3.805	23.010	0.030	13.853	0.104	63.816
H+1S												
INCREMENT!	0.059	0.033	0.000	56.353	0.090	0.011	3.824	8.022	-0.022	4.153	0.160	67.027
TOTAL AMB!	0.059	0.033	0.000	56.354	0.090	0.011	6.760	18.353	0.016	17.039	0.233	63.684
H												
INCREMENT!	0.098	0.051	0.000	51.854	0.046	0.018	6.299	8.012	-0.025	6.849	0.264	67.000
TOTAL AMB!	0.098	0.051	0.000	51.854	0.046	0.018	9.235	11.333	0.013	19.735	0.332	63.002
H-1S												
INCREMENT!	0.060	0.034	0.000	56.043	0.038	0.011	3.892	8.021	-0.022	4.027	0.163	67.023
TOTAL AMB!	0.060	0.034	0.000	56.043	0.038	0.011	6.823	18.269	0.016	17.163	0.291	63.001
H-2S												
INCREMENT!	0.026	0.017	0.000	64.655	0.409	0.005	1.706	8.033	-0.015	1.833	0.071	67.000
TOTAL AMB!	0.026	0.017	0.000	64.656	0.409	0.005	4.642	19.293	0.023	14.774	0.239	63.151
0												
INCREMENT!	0.026	0.017	0.000	63.037	0.393	0.005	1.705	8.031	-0.017	1.833	0.071	67.000
TOTAL AMB!	0.026	0.017	0.000	63.037	0.393	0.005	4.641	19.307	0.021	14.774	0.239	63.151

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-3 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.
PLUME-OBSERVER DISTANCE (KM) = 34.5
AZIMUTH OF LINE-OF-SIGHT = 169.8
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
54.																
	21.	0.19	141.4	23.59	78.97	91.23	0.3307	0.3340	-8.98	-3.91	-0.1122	0.6578	0.0159	0.0078	13.4184	8.215

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 120.0
PLUME-OBSERVER DISTANCE (KM) = 34.5
AZIMUTH OF LINE-OF-SIGHT = 169.8
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
THETA = 54.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.19	0.45	79.98	91.69	0.3336	0.3347	-10.26	-4.42	-0.1220	0.9031	0.0133	0.0061	11.6061	7.5578
0.3	0.19	0.45	75.16	89.48	0.3242	0.3299	-2.85	-1.32	-0.0440	0.7992	0.0183	0.0122	15.1571	8.8194
0.0	0.19	0.45	73.10	88.50	0.3198	0.3277	0.33	0.16	-0.0044	0.7398	0.0220	0.0154	17.4343	10.1832

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 120.0
PLUME-OBSERVER DISTANCE (KM) = 34.5
AZIMUTH OF LINE-OF-SIGHT = 169.8
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.1
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
54.																
FOR SKY BACKGROUND:																
	24.	0.19	142.9	22.78	79.15	91.31	0.3337	0.3378	-9.09	-3.96	-0.1103	0.8307	0.0179	0.0113	15.1316	9.403
FOR WHITE BACKGROUND:																
	24.	0.19	143.5	22.45	80.21	91.79	0.3364	0.3386	-10.49	-4.50	-0.1213	0.8563	0.0159	0.0097	13.6066	8.764
FOR GRAY BACKGROUND:																
	24.	0.19	139.5	24.61	75.15	89.47	0.3263	0.3337	-3.00	-1.33	-0.0445	0.7662	0.0213	0.0158	17.4819	10.363
FOR BLACK BACKGROUND:																
	24.	0.19	137.5	25.68	72.98	88.45	0.3224	0.3314	0.21	0.10	-0.0033	0.7037	0.0245	0.0193	19.8303	11.721

Exhibit A-3 (concluded)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 5610.
SIGMA Z (M) = 222.
SO2-SO4 CONVERSION RATE= 0.5127 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0890 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY BSP-TOTAL (UG/M3)	(10-6 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	0.007	0.005	0.000	70.820	2.786	0.001	0.659	14.604	-0.005	0.515	0.031	79.421
TOTAL AMB!	0.007	0.005	0.000	70.821	2.786	0.001	3.805	42.982	0.033	13.451	0.159	67.920
H+1S												
INCREMENT!	0.032	0.021	0.000	64.940	0.366	0.006	3.714	14.256	-0.015	2.269	0.134	78.906
TOTAL AMB!	0.032	0.021	0.000	64.940	0.366	0.006	6.650	22.944	0.023	15.205	0.293	78.407
H												
INCREMENT!	0.053	0.033	0.000	61.167	0.190	0.009	6.120	14.223	-0.018	3.748	0.221	78.804
TOTAL AMB!	0.053	0.033	0.000	61.167	0.190	0.009	9.056	19.702	0.020	16.684	0.349	78.340
H-1S												
INCREMENT!	0.035	0.022	0.000	64.209	0.341	0.006	3.968	14.254	-0.016	2.425	0.143	78.981
TOTAL AMB!	0.035	0.022	0.000	64.209	0.341	0.006	6.904	22.435	0.022	15.361	0.271	72.413
H-2S												
INCREMENT!	0.022	0.015	0.000	65.324	1.178	0.004	2.631	14.417	-0.013	1.590	0.095	79.120
TOTAL AMB!	0.022	0.015	0.000	65.324	1.178	0.004	5.567	26.279	0.025	14.526	0.223	71.076
0												
INCREMENT!	0.020	0.013	0.002	59.262	10.799	0.004	2.923	16.021	-0.013	1.590	0.103	80.208
TOTAL AMB!	0.020	0.013	0.002	59.262	10.799	0.004	5.859	27.660	0.025	14.526	0.231	72.113

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-4. The results of the observer-based PLUVUE run at points 220 and 240 km from the emissions source. The tables of secondary aerosol conversion are printed after the optics data for the last observed point. The last table verifies the output for plotting.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.
PLUME-OBSERVER DISTANCE (KM) = 132.7
AZIMUTH OF LINE-OF-SIGHT = 185.8
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
65.																
	5.	0.72	106.8	42.25	73.06	88.49	0.3115	0.3202	-0.99	-0.47	-0.0193	0.9566	0.0010	-0.0013	1.5864	1.206

OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME-OBSERVER DISTANCE (KM) = 132.7
AZIMUTH OF LINE-OF-SIGHT = 185.8
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
THETA = 65.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)

BACKGROUND OBJECT IS BETWEEN OBSERVER AND CENTER OF PLUME AND CALCULATION IS STOPPED.

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME-OBSERVER DISTANCE (KM) = 132.7
AZIMUTH OF LINE-OF-SIGHT = 185.8
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
65.																
FOR SKY BACKGROUND:																
	148.	0.72	59.3	67.95	70.60	87.30	0.3148	0.3209	-3.74	-1.79	-0.0565	0.9799	0.0027	-0.0008	3.2402	2.475
FOR WHITE BACKGROUND:																
	1.	0.72	183.8	0.63	81.65	92.43	0.3234	0.3300	-0.40	-0.18	-0.0051	1.0007	0.0002	0.0000	0.2536	0.206
FOR GRAY BACKGROUND:																
	1.	0.72	183.5	0.83	61.82	82.83	0.3003	0.3109	0.17	0.09	0.0027	0.9954	0.0003	0.0003	0.2337	0.156
FOR BLACK BACKGROUND:																
	1.	0.72	183.2	0.96	53.32	78.09	0.2863	0.2996	0.42	0.25	0.0078	0.9888	0.0005	0.0005	0.4062	0.317

Exhibit A-4 (continued)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 5997.
SIGMA Z (M) = 226.
SO2-SO4 CONVERSION RATE= 0.5144 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.1009 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	0.007	0.005	0.000	70.366	3.703	0.001	0.878	16.021	-0.004	0.477	0.031	80.898
TOTAL AMB!	0.007	0.005	0.000	70.367	3.703	0.001	3.814	45.316	0.034	13.413	0.159	68.185
H+1S												
INCREMENT!	0.030	0.020	0.000	65.877	0.482	0.005	3.710	15.466	-0.014	2.090	0.131	80.256
TOTAL AMB!	0.030	0.020	0.000	65.877	0.482	0.005	6.646	24.635	0.024	15.025	0.260	72.795
H												
INCREMENT!	0.049	0.031	0.000	62.587	0.250	0.009	6.112	15.421	-0.017	3.453	0.217	69.209
TOTAL AMB!	0.049	0.031	0.000	62.587	0.250	0.009	9.048	21.253	0.021	16.389	0.345	74.610
H-1S												
INCREMENT!	0.032	0.021	0.000	65.123	0.448	0.006	4.001	15.461	-0.015	2.254	0.142	80.250
TOTAL AMB!	0.032	0.021	0.000	65.123	0.448	0.006	6.937	24.074	0.023	15.190	0.270	73.077
H-2S												
INCREMENT!	0.022	0.014	0.000	65.924	1.611	0.004	2.763	15.676	-0.013	1.536	0.098	80.468
TOTAL AMB!	0.022	0.014	0.000	65.924	1.611	0.004	5.701	27.710	0.025	14.472	0.226	71.772
0												
INCREMENT!	0.021	0.014	0.001	64.110	2.692	0.004	2.798	15.862	-0.014	1.536	0.099	80.653
TOTAL AMB!	0.021	0.014	0.001	64.110	2.692	0.004	5.734	27.859	0.024	14.472	0.227	71.033

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

	SO2!	0.0000
	NOX!	0.0000
PRIMARY PARTICULATE!		0.0000
	SO4!	0.0000
	NO3!	0.0000

Exhibit A-4 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
OF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME-OBSERVER DISTANCE (KM) = 152.6
AZIMUTH OF LINE-OF-SIGHT = 186.6
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
THETA = 65.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)

BACKGROUND OBJECT IS BETWEEN OBSERVER AND CENTER OF PLUME AND CALCULATION IS STOPPED.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.
PLUME-OBSERVER DISTANCE (KM) = 152.6
AZIMUTH OF LINE-OF-SIGHT = 186.6
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
65.																
	5.	0.83	109.0	41.06	73.03	38.48	0.3115	0.3203	-0.52	-0.25	-0.0120	0.9549	0.0010	-0.0008	1.2722	0.918

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME-OBSERVER DISTANCE (KM) = 152.6
AZIMUTH OF LINE-OF-SIGHT = 186.6
ELEVATION ANGLE OF LINE-OF-SIGHT = 0.0
SOLAR ZENITH ANGLE = 51.0 AT 900. ON 9/21

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
63.																
FOR SKY BACKGROUND:																
	102.	0.83	62.2	66.39	70.49	87.25	0.3143	0.3207	-3.35	-1.61	-0.0311	0.9842	0.0023	-0.0009	2.8692	2.221
FOR WHITE BACKGROUND:																
	0.	0.83	185.0	0.00	81.51	92.36	0.3232	0.3298	-0.00	0.00	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.000
FOR GRAY BACKGROUND:																
	0.	0.83	185.0	0.00	61.59	82.71	0.3001	0.3108	-0.00	0.00	-0.0000	1.0000	0.0000	0.0000	0.0000	0.000
FOR BLACK BACKGROUND:																
	0.	0.83	185.0	0.00	53.06	77.93	0.2864	0.2994	0.00	0.00	-0.0000	1.0000	0.0000	0.0000	0.0000	0.000

Exhibit A-4 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 1.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	900	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 2.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	851	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.3	900	0.50	0.50	0.50	0.50	0.50	2.16	0.00	0.00	0.00	0.00	0.00	11.64

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 5.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	826	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.3	835	0.50	0.50	0.50	0.50	0.50	2.05	0.00	0.00	0.00	0.00	0.00	10.83
0.7	900	0.50	0.50	0.50	0.50	0.50	2.16	0.00	0.00	0.00	0.00	0.00	11.64

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 10.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	745	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.3	753	0.50	0.50	0.50	0.50	0.50	1.70	0.00	0.00	0.00	0.00	0.00	8.49
0.7	818	0.50	0.50	0.50	0.50	0.50	1.82	0.00	0.00	0.00	0.00	0.00	9.21
1.4	900	0.50	0.50	0.50	0.50	0.50	2.16	0.00	0.00	0.00	0.00	0.00	11.64

Exhibit A-4 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 20.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0
0.1	622	0.50	0.50	0.50	0.50	0.50	0.50
0.3	630	0.50	0.50	0.50	0.50	0.50	1.13
0.7	655	0.50	0.50	0.50	0.50	0.50	1.26
1.4	737	0.50	0.50	0.50	0.50	0.50	1.58
2.8	900	0.50	0.50	0.50	0.50	0.50	2.16

NOX-TO-HNO3 CONVERSION RATE (%/HR)

N+2S	N+1S	N	N-1S	N-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	4.78
0.00	0.00	0.00	0.00	0.00	5.34
0.00	0.00	0.00	0.00	0.00	7.59
0.01	0.00	0.00	0.00	0.01	11.64

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 40.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0
0.1	336	0.50	0.50	0.50	0.50	0.50	0.50
0.3	345	0.50	0.50	0.50	0.50	0.50	0.69
0.7	410	0.50	0.50	0.50	0.50	0.50	0.63
1.4	451	0.50	0.50	0.50	0.50	0.50	0.73
2.8	614	0.50	0.50	0.50	0.50	0.50	1.10
5.5	900	0.50	0.50	0.50	0.50	0.50	1.92

NOX-TO-HNO3 CONVERSION RATE (%/HR)

N+2S	N+1S	N	N-1S	N-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.72
0.00	0.00	0.00	0.00	0.00	0.94
0.00	0.00	0.00	0.00	0.00	1.60
0.00	0.00	0.00	0.00	0.00	3.22
0.03	0.01	0.00	0.01	0.03	3.61

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 60.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0
0.1	31	0.50	0.50	0.50	0.50	0.50	0.50
0.3	59	0.50	0.50	0.50	0.50	0.50	0.50
0.7	124	0.50	0.50	0.50	0.50	0.50	0.50
1.4	295	0.50	0.50	0.50	0.50	0.50	0.50
2.8	529	0.50	0.50	0.50	0.50	0.50	0.50
5.5	614	0.50	0.50	0.50	0.50	0.50	0.52
8.3	900	0.52	0.50	0.50	0.50	0.51	0.58

NOX-TO-HNO3 CONVERSION RATE (%/HR)

N+2S	N+1S	N	N-1S	N-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.11
0.11	0.02	0.01	0.02	0.10	0.54

Exhibit A-4 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 80.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0
0.1	2205	0.50	0.50	0.50	0.50	0.50	0.50
0.3	2213	0.50	0.50	0.50	0.50	0.50	0.50
0.7	2233	0.50	0.50	0.50	0.50	0.50	0.50
1.4	2320	0.50	0.50	0.50	0.50	0.50	0.50
2.8	42	0.50	0.50	0.50	0.50	0.50	0.50
5.5	323	0.50	0.50	0.50	0.50	0.50	0.50
8.3	614	0.50	0.50	0.50	0.50	0.50	0.50
11.0	900	0.53	0.50	0.50	0.50	0.52	0.54

NOX-TO-HNO3 CONVERSION RATE (%/HR)

N+2S	N+1S	N	N-1S	N-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01
0.21	0.03	0.02	0.03	0.17	0.23

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 100.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0
0.1	1919	0.50	0.50	0.50	0.50	0.50	0.50
0.3	1928	0.50	0.50	0.50	0.50	0.50	0.50
0.7	1952	0.50	0.50	0.50	0.50	0.50	0.50
1.4	2034	0.50	0.50	0.50	0.50	0.50	0.50
2.8	2157	0.50	0.50	0.50	0.50	0.50	0.50
5.5	42	0.50	0.50	0.50	0.50	0.50	0.50
8.3	323	0.50	0.50	0.50	0.50	0.50	0.50
11.0	614	0.50	0.50	0.50	0.50	0.50	0.50
13.8	900	0.55	0.51	0.50	0.51	0.53	0.53

NOX-TO-HNO3 CONVERSION RATE (%/HR)

N+2S	N+1S	N	N-1S	N-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01
0.32	0.04	0.03	0.04	0.21	0.23

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 120.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0
0.1	1634	0.50	0.50	0.50	0.50	0.50	0.50
0.3	1642	0.50	0.50	0.50	0.50	0.50	0.50
0.7	1707	0.50	0.50	0.50	0.50	0.50	0.50
1.4	1743	0.50	0.50	0.50	0.50	0.50	0.50
2.8	1911	0.50	0.50	0.50	0.50	0.50	0.50
5.5	2157	0.50	0.50	0.50	0.50	0.50	0.50
8.3	42	0.50	0.50	0.50	0.50	0.50	0.50
11.0	328	0.50	0.50	0.50	0.50	0.50	0.50
13.8	614	0.50	0.50	0.50	0.50	0.50	0.50
16.6	900	0.56	0.51	0.50	0.51	0.53	0.53

NOX-TO-HNO3 CONVERSION RATE (%/HR)

N+2S	N+1S	N	N-1S	N-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.00	0.00	0.00	0.00	0.01
0.43	0.06	0.03	0.06	0.22	0.22

Exhibit A-4 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 140.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	1348	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.3	1356	0.50	0.50	0.50	0.50	0.50	0.60	0.00	0.00	0.00	0.00	0.00	0.73
0.7	1421	0.50	0.50	0.50	0.50	0.50	0.57	0.00	0.00	0.00	0.00	0.00	0.52
1.4	1502	0.50	0.50	0.50	0.50	0.50	0.51	0.00	0.00	0.00	0.00	0.00	0.03
2.8	1625	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.02
5.5	1911	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
8.3	2137	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
11.0	42	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
13.8	328	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
16.6	614	0.50	0.50	0.50	0.50	0.50	0.50	0.01	0.00	0.00	0.00	0.01	0.00
19.3	900	0.58	0.51	0.51	0.51	0.53	0.53	0.54	0.03	0.04	0.03	0.23	0.22

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 160.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	1102	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.3	1110	0.50	0.50	0.50	0.50	0.50	2.28	0.00	0.00	0.00	0.00	0.00	12.45
0.7	1135	0.50	0.50	0.50	0.50	0.50	2.16	0.00	0.00	0.00	0.00	0.00	11.65
1.4	1217	0.50	0.50	0.50	0.50	0.50	1.82	0.00	0.00	0.00	0.00	0.00	9.23
2.8	1340	0.50	0.50	0.50	0.50	0.50	1.26	0.00	0.00	0.00	0.00	0.00	5.31
5.5	1625	0.50	0.50	0.50	0.50	0.50	0.53	0.00	0.00	0.00	0.00	0.00	0.19
8.3	1911	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
11.0	2157	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
13.8	42	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
16.6	328	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
19.3	614	0.50	0.50	0.50	0.50	0.50	0.50	0.02	0.00	0.00	0.00	0.01	0.00
22.1	900	0.59	0.51	0.51	0.51	0.53	0.53	0.65	0.10	0.05	0.10	0.23	0.22

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 180.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		N+2S	N+1S	N	N-1S	N-2S	0	N+2S	N+1S	N	N-1S	N-2S	0
0.1	816	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.3	825	0.50	0.50	0.50	0.50	0.50	3.50	0.00	0.00	0.00	0.00	0.00	20.93
0.7	850	0.50	0.50	0.50	0.50	0.50	3.50	0.00	0.00	0.00	0.00	0.00	20.97
1.4	931	0.50	0.50	0.50	0.50	0.50	3.49	0.01	0.00	0.00	0.00	0.01	20.92
2.8	1054	0.50	0.50	0.50	0.50	0.50	3.33	0.02	0.00	0.00	0.00	0.02	19.82
5.5	1340	0.51	0.50	0.50	0.50	0.51	1.08	0.04	0.01	0.00	0.01	0.04	4.08
8.3	1625	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.03
11.0	1911	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
13.8	2157	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
16.6	42	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
19.3	328	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
22.1	614	0.50	0.50	0.50	0.50	0.50	0.50	0.02	0.00	0.00	0.00	0.01	0.01
24.9	900	0.61	0.52	0.51	0.52	0.53	0.54	0.76	0.12	0.07	0.12	0.24	0.30

Exhibit A-4 (continued)

AGE (HR)	TIME	H+2S	H+1S	H	H-1S	H-2S	0
0.1	531	0.50	0.50	0.50	0.50	0.50	0.50
0.3	539	0.50	0.50	0.50	0.50	0.50	1.56
0.7	604	0.50	0.50	0.50	0.50	0.50	1.68
1.4	643	0.50	0.50	0.50	0.50	0.50	2.02
2.8	808	0.50	0.50	0.50	0.50	0.50	2.60
5.5	1034	0.51	0.50	0.50	0.50	0.51	1.74
8.3	1340	0.52	0.50	0.50	0.50	0.52	0.64
11.0	1625	0.50	0.50	0.50	0.50	0.50	0.50
13.8	1911	0.50	0.50	0.50	0.50	0.50	0.50
16.6	2157	0.50	0.50	0.50	0.50	0.50	0.50
19.3	42	0.50	0.50	0.50	0.50	0.50	0.50
22.1	328	0.50	0.50	0.50	0.50	0.50	0.50
24.9	614	0.50	0.50	0.50	0.50	0.50	0.50
27.6	900	0.62	0.52	0.51	0.52	0.54	0.57

H+2S	H+1S	H	H-1S	H-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	7.42
0.00	0.00	0.00	0.00	0.00	8.23
0.00	0.00	0.00	0.00	0.00	10.66
0.01	0.00	0.00	0.00	0.01	14.67
0.06	0.01	0.01	0.01	0.06	8.63
0.12	0.02	0.01	0.02	0.12	1.00
0.01	0.00	0.00	0.00	0.01	0.03
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.00	0.00	0.00	0.01	0.01
0.07	0.14	0.03	0.13	0.25	0.[illegible]

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 220.0 KM

SO2-TO-SO4= CONVERSION RATE (%/HR)

PARCEL AGE (HR)	LOCAL TIME	H+2S	H+1S	H	H-1S	H-2S	0
0.1	245	0.50	0.50	0.50	0.50	0.50	0.50
0.3	253	0.50	0.50	0.50	0.50	0.50	0.51
0.7	318	0.50	0.50	0.50	0.50	0.50	0.51
1.4	409	0.50	0.50	0.50	0.50	0.50	0.53
2.8	522	0.50	0.50	0.50	0.50	0.50	0.69
5.5	808	0.50	0.50	0.50	0.50	0.50	0.81
8.3	1054	0.53	0.50	0.50	0.50	0.53	0.71
11.0	1340	0.53	0.50	0.50	0.50	0.53	0.58
13.8	1625	0.50	0.50	0.50	0.50	0.50	0.50
16.6	1911	0.50	0.50	0.50	0.50	0.50	0.50
19.3	2157	0.50	0.50	0.50	0.50	0.50	0.50
22.1	42	0.50	0.50	0.50	0.50	0.50	0.50
24.9	328	0.50	0.50	0.50	0.50	0.50	0.50
27.6	614	0.50	0.50	0.50	0.50	0.50	0.50
30.4	900	0.64	0.52	0.51	0.52	0.54	0.57

NOX-TO-HNO3 CONVERSION RATE (%/HR)

H+2S	H+1S	H	H-1S	H-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.06
0.00	0.00	0.00	0.00	0.00	0.08
0.00	0.00	0.00	0.00	0.00	0.23
0.00	0.00	0.00	0.00	0.00	1.33
0.02	0.00	0.00	0.00	0.02	2.14
0.20	0.03	0.02	0.03	0.20	1.45
0.24	0.03	0.02	0.03	0.20	0.53
0.02	0.00	0.00	0.00	0.01	0.02
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.03	0.00	0.00	0.00	0.01	0.01
0.07	0.16	0.09	0.15	0.27	0.48

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 240.0 KM

SO2-TO-SO4= CONVERSION RATE (%/HR)

PARCEL AGE (HR)	LOCAL TIME	H+2S	H+1S	H	H-1S	H-2S	0
0.1	2359	0.50	0.50	0.50	0.50	0.50	0.50
0.3	3	0.50	0.50	0.50	0.50	0.50	0.50
0.7	32	0.50	0.50	0.50	0.50	0.50	0.50
1.4	114	0.50	0.50	0.50	0.50	0.50	0.50
2.8	237	0.50	0.50	0.50	0.50	0.50	0.50
5.5	522	0.50	0.50	0.50	0.50	0.50	0.50
8.3	808	0.51	0.50	0.50	0.50	0.51	0.54
11.0	1054	0.56	0.51	0.50	0.51	0.55	0.58
13.8	1340	0.53	0.51	0.50	0.51	0.53	0.54
16.6	1625	0.50	0.50	0.50	0.50	0.50	0.50
19.3	1911	0.50	0.50	0.50	0.50	0.50	0.50
22.1	2157	0.50	0.50	0.50	0.50	0.50	0.50
24.9	42	0.50	0.50	0.50	0.50	0.50	0.50
27.6	328	0.50	0.50	0.50	0.50	0.50	0.50
30.4	614	0.50	0.50	0.50	0.50	0.50	0.50
33.1	900	0.65	0.53	0.51	0.52	0.54	0.54

NOX-TO-HNO3 CONVERSION RATE (%/HR)

H+2S	H+1S	H	H-1S	H-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01
0.05	0.01	0.00	0.01	0.05	0.27
0.39	0.05	0.03	0.05	0.33	0.57
0.37	0.05	0.03	0.05	0.24	0.39
0.03	0.00	0.00	0.00	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00
0.03	0.00	0.00	0.00	0.01	0.01
1.08	0.19	0.10	0.17	0.23	0.31

Exhibit A-4 (continued)

PLOT FILE VERIFICATION

OBSERVER-BASED DATA

SKY BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	52.530	52.937	53.826	51.327	40.167	27.501	16.039	7.419	10.637	23.591	40.679	47.959	45.096	43.730	42.247	41.06
BLUE-RED RATIO	1.022	1.021	1.019	1.014	1.003	0.956	0.861	0.742	0.733	0.838	0.923	0.951	0.957	0.958	0.957	0.95
PLUME CONTRAST AT 0.55 MICRONS	-0.037	-0.070	-0.082	-0.090	-0.105	-0.135	-0.153	-0.111	-0.084	-0.112	-0.094	-0.068	-0.046	-0.030	-0.019	-0.01
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	2.312	2.814	3.333	3.621	4.148	5.491	8.602	12.527	12.902	8.315	5.066	3.462	2.386	1.677	1.206	0.91
WHITE BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	1.259	1.248	1.219	1.187	1.146	1.065	0.934	0.757	0.766	0.903	1.039	0.000	0.000	0.000	0.000	0.00
PLUME CONTRAST AT 0.55 MICRONS	-0.038	-0.100	-0.111	-0.113	-0.132	-0.162	-0.180	-0.114	-0.085	-0.122	-0.045	0.000	0.000	0.000	0.000	0.00
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	5.061	5.232	5.344	5.293	5.397	5.971	8.184	12.323	12.845	7.558	3.153	0.000	0.000	0.000	0.000	0.00

Exhibit A-4 (continued)

GRAY BACKGROUND

NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.996	0.996	0.996	0.994	0.985	0.939	0.846	0.740	0.752	0.799	0.872	0.000	0.000	0.000	0.000	0.00
PLUME CONTRAST AT 0.55 MICRONS	-0.026	-0.040	-0.054	-0.068	-0.079	-0.110	-0.129	-0.107	-0.078	-0.043	0.173	0.000	0.000	0.000	0.000	0.00
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	1.006	1.573	2.155	2.831	3.188	4.874	8.393	12.601	13.160	8.819	6.239	0.000	0.000	0.000	0.000	0.00

BLACK BACKGROUND

NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.382	0.836	0.894	0.902	0.904	0.871	0.791	0.732	0.745	0.740	0.729	0.000	0.000	0.000	0.000	0.00
PLUME CONTRAST AT 0.55 MICRONS	0.003	-0.011	-0.026	-0.037	-0.054	-0.084	-0.102	-0.104	-0.075	-0.004	0.314	0.000	0.000	0.000	0.000	0.00
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	2.137	2.279	2.446	2.650	3.234	5.126	8.925	12.729	13.303	10.133	11.033	0.000	0.000	0.000	0.000	0.00

Exhibit A-4 (concluded)

first case. The plume-based calculations were limited to scattering angles of 45°, 90°, and 135° by setting NT1 to 2 and NT2 to 5.

Exhibit A-6 presents the beginning of the printout for the plume-based run of PLUVUE. All tables are included for the input data verification, background optical properties, initial plume rise, plume gas and aerosol concentrations, and all visual effects, for the first two observed points on the plume (1 and 2 km from the source). Note that the size of the print file is quite large, even for three different scattering angles. When the number of scattering angles is increased to six, the number of optics tables is doubled, and the print file becomes almost twice as large as it is in this sample.

Exhibit A-7 presents the results of the same PLUVUE run for the observed points at 100 and 120 km from the source. For both points, the tables are printed for: plume contributions of pollutants; results from optics calculations for horizontal lines of sight with sky backgrounds; results from optics calculations for nonhorizontal lines of sight with sky backgrounds; results from optics calculations for horizontal lines of sight with white, gray, and black backgrounds; and results from optics calculations for views along axes of plumes with sky backgrounds.

Exhibit A-8 presents the tables for the last two observed points on the plume trajectory, plus the usual tables for secondary aerosol formation rates and the table verifying the data written to Fortran logical unit 8. This data is used as input by the program VISPLOT to generate plots of the four key visibility impairment parameters: percentage reduction in visual range, plume contrast, blue-red ratio, and ΔE.

```
1600 MW POWER PLANT
  4.5     5+0.00
000414
0.          0.
1000.0
45.
    0
 1 1 1 116 2 5 1
 1
1.          2.          5.          10.         20.         40.         60.         80.
100.        120.        140.        160.        180.        200.        220.        240.
     37.50      131.80       4.90
 1555980.0      138.0        3.0        17.5
  4.0600.0
      45.0
     0.000      0.000      0.038      0.000
     0.125      2.750      0.125      0.850
     2.200      2.200      1.500      1.500
     1.800      2.000      1.800      2.000
    10.000
    2
    185.
 1.00 1.00 0.10 0.10
    0
 0.0
    1     1
 3 4 3 3 2 3
    498.9      4338.5     5650.0
   12     9   210900.    7. 1979
```

Exhibit A-5. Input data file used for second example of a PLUVUE run.

```
VISUAL IMPACT ASSESSMENT FOR 1600 MW POWER PLANT
    EMISSIONS SOURCE DATA
        ELEVATION OF SITE =          5630.   FEET MSL
                                     1722.   METERS MSL

        NO. OF UNITS =      4.
        STACK HEIGHT =    600.   FEET
                          183.   METERS
        FLUE GAS FLOW RATE =     1555980.   CU FT/MIN
                                  734.23    CU M/SEC
        FLUE GAS TEMPERATURE =        138.   F
                                      332.   K
        FLUE GAS OXYGEN CONTENT =       3.0   MOL PERCENT
        SO2 EMISSION RATE (TOTAL) =    37.50   TONS/DAY
                                    3.397E 02   G/SEC
        NOX EMISSION RATE (TOTAL,AS NO2) =     151.00   TONS/DAY
                                    1.384E 03   G/SEC
        PARTICULATE EMISSION RATE (TOTAL) =      4.90   TONS/DAY
                                    5.145E 01   G/SEC
```

Exhibit A-6. Beginning of output for plume-based PLUVUE run, including the tables of visual effects for the second observed point.

METEOROLOGICAL AND AMBIENT AIR QUALITY DATA
WINDSPEED = 4.5 MILES/HR
2.0 M/SEC
PASQUILL-GIFFORD-TURNER STABILITY CATEGORY E
LAPSE RATE = 0.00 F/1000 FT
0.000E-01 K/M
POTENTIAL TEMPERATURE LAPSE RATE = 9.800E-03 K/M
AMBIENT TEMPERATURE = 45.0 F
280.4 K
RELATIVE HUMIDITY = 45.0 %
MIXING DEPTH = 1000. M
AMBIENT PRESSURE = 0.82 ATM
BACKGROUND NOX CONCENTRATION = 0.000 PPM
BACKGROUND NO2 CONCENTRATION = 0.000 PPM
BACKGROUND OZONE CONCENTRATION = 0.038 PPM
BACKGROUND SO2 CONCENTRATION = 0.000 PPM
BACKGROUND COARSE MODE CONCENTRATION = 10.0 UG/M3
BACKGROUND SULFATE CONCENTRATION = 2.9 UG/M3
BACKGROUND NITRATE CONCENTRATION = 0.0 UG/M3
BACKGROUND VISUAL RANGE = 185.0 KILOMETERS
SO2 DEPOSITION VELOCITY = 1.00 CM/SEC
NOX DEPOSITION VELOCITY = 1.00 CM/SEC
COARSE PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC
SUBMICRON PARTICULATE DEPOSITION VELOCITY = 0.10 CM/SEC

AEROSOL STATISTICS

	BACKGROUND		PLUME	
	ACCUMULATION MODE	COARSE MODE	ACCUMULATION MODE	COARSE MODE
MASS MEDIAN RADIUS MICROMETERS	0.125	2.750	0.125	0.850
GEOMETRIC STANDARD DEVIATION	2.200	2.200	1.500	1.500
PARTICLE DENSITY G/(CM**3)	1.800	2.000	1.800	2.000

SIMULATION IS FOR 900. HOURS ON 9/21
SOLAR ZENITH ANGLE (DEGREES) = 51.0
SOLAR AZIMUTH ANGLE (DEGREES) = 129.0

BACKGROUND CONDITIONS

ACCUMULATION MODE			COARSE PARTICLE MODE			PRIMARY PARTICLE MODE		
MASS RADIUS	SIGMA	BSCAT.55/MASS	MASS RADIUS	SIGMA	BSCAT.55/MASS	MASS RADIUS	SIGMA	BSCAT.55/MASS
0.1250E 00	0.2200E 01	0.2844E-02	0.2750E 01	0.2200E 01	0.4469E-03	0.8500E 00	0.1500E 01	0.1242E-02

COEFFICIENTS AT 0.55 MICROMETERS , 1./KM

BTARAY =0.9747E-02 BTAAER =0.1282E-01 ABSNO2 =0.0000E 00 BTABAC =0.2115E-01

Exhibit A-6 (continued)

INITIAL PLUME RISE AND DILUTION AND NITROGEN DIOXIDE FORMATION
1600 MW POWER PLANT

TIME (SEC)	X (M)	DELTA H (M)	U (M/S)	W (M/S)	V (M/S)	SIGMA (M)	TEMP (K)	O2 MOL P	NO2-NO RATIO EQUIL	NO2-NO RATIO ACTUAL	NOX (PPM)	NO (PPM)	NO2T (PPM)	SO2 (PPM)	PARTICULATE UG/M3
0.	0.0	0.0	2.01	17.50	17.50	0.0	302.0	3.0	5.9E 04	4.2E-03	340.166	333.750	1.416	69.579	2.8[illegible]E 04
10.	20.1	31.6	2.01	1.00	2.25	7.3	[illegible]9.9	3.8	7.2E 04	6.2E-03	325.892	323.893	1.999	66.660	2.2[illegible]E 04
20.	40.2	50.2	2.01	0.80	2.17	11.7	[illegible]8.8	14.5	5.8E 05	3.6E-03	121.423	120.390	1.033	24.836	8.4[illegible]E 03
30.	60.3	65.7	2.01	0.71	2.13	15.3	291.9	17.3	9.0E 05	1.3E-02	69.976	69.100	0.876	14.313	4.8[illegible]E 03
40.	80.5	79.6	2.01	0.64	2.11	18.5	297.6	18.4	1.1E 06	1.6E-02	47.571	46.841	0.730	9.789	3.2[illegible]E 03
50.	100.6	92.4	2.01	0.60	2.10	21.5	295.7	19.1	1.2E 06	1.8E-02	35.323	34.706	0.616	7.285	2.4[illegible]E 03
60.	120.7	104.3	2.01	0.56	2.09	24.3	294.6	19.5	1.3E 06	1.9E-02	27.715	27.186	0.528	5.669	1.9[illegible]E 03
70.	140.8	115.6	2.01	0.54	2.08	26.9	293.8	19.8	1.3E 06	2.1E-02	22.503	22.123	0.460	4.619	1.5[illegible]E 03
80.	160.9	126.4	2.01	0.51	2.08	29.4	293.2	19.9	1.4E 06	2.2E-02	18.916	18.610	0.406	3.899	1.3[illegible]E 03
90.	181.0	136.7	2.01	0.49	2.07	31.8	292.8	20.1	1.4E 06	2.3E-02	16.180	15.818	0.362	3.339	1.1[illegible]E 03
100.	201.1	146.7	2.01	0.48	2.07	34.1	292.5	20.2	1.4E 06	2.4E-02	14.070	13.745	0.325	2.893	9.5[illegible]E 02
110.	221.3	156.3	2.01	0.46	2.06	36.3	292.3	20.3	1.5E 06	2.4E-02	12.400	12.105	0.295	2.536	8.3[illegible]E 02
120.	241.4	165.6	2.01	0.45	2.06	38.5	292.1	20.4	1.5E 06	2.5E-02	11.049	10.779	0.270	2.260	7.3[illegible]E 02
130.	261.5	174.7	2.01	0.44	2.06	40.6	291.9	20.4	1.5E 06	2.6E-02	9.937	9.689	0.248	2.033	6.6[illegible]E 02
140.	281.6	183.6	2.01	0.43	2.06	42.7	291.7	20.5	1.5E 06	2.6E-02	9.007	8.778	0.229	1.842	6.0[illegible]E 02
150.	301.7	192.2	2.01	0.42	2.05	44.7	291.6	20.5	1.5E 06	2.7E-02	8.220	8.007	0.213	1.681	5.5[illegible]E 02
160.	321.8	200.6	2.01	0.41	2.05	46.7	291.5	20.5	1.5E 06	2.7E-02	7.546	7.347	0.198	1.543	5.0[illegible]E 02
170.	342.0	208.7	2.01	0.40	2.05	48.5	291.4	20.6	1.5E 06	2.7E-02	6.977	6.791	0.186	1.427	4.6[illegible]E 02
180.	362.1	208.7	2.01	0.39	2.05	48.5	291.4	20.6	1.5E 06	2.8E-02	6.982	6.794	0.189	1.433	4.6[illegible]E 02
190.	382.2	208.7	2.01	0.39	2.05	48.5	291.4	20.6	1.5E 06	2.8E-02	6.987	6.796	0.191	1.439	4.6[illegible]E 02
200.	402.3	208.7	2.01	0.38	2.05	48.5	291.4	20.6	1.5E 06	2.8E-02	6.991	6.797	0.194	1.443	4.6[illegible]E 02
210.	422.4	208.7	2.01	0.37	2.05	48.5	291.4	20.6	1.5E 06	2.9E-02	6.995	6.798	0.196	1.447	4.6[illegible]E 02
220.	442.5	208.7	2.01	0.37	2.04	48.5	291.4	20.6	1.5E 06	2.9E-02	6.998	6.799	0.199	1.451	4.6[illegible]E 02
230.	462.6	208.7	2.01	0.36	2.04	48.5	291.4	20.6	1.5E 06	3.0E-02	7.001	6.800	0.201	1.454	4.6[illegible]E 02
240.	482.8	208.7	2.01	0.36	2.04	48.5	291.4	20.6	1.5E 06	3.0E-02	7.005	6.801	0.204	1.457	4.6[illegible]E 02
250.	502.9	208.7	2.01	0.35	2.04	48.5	291.4	20.6	1.5E 06	3.0E-02	7.007	6.801	0.205	1.459	4.6[illegible]E 02
260.	523.0	208.7	2.01	0.35	2.04	48.5	291.4	20.6	1.5E 06	3.1E-02	7.010	6.801	0.209	1.464	4.6[illegible]E 02
270.	543.1	208.7	2.01	0.34	2.04	48.5	291.4	20.6	1.5E 06	3.1E-02	7.013	6.801	0.211	1.466	4.6[illegible]E 02
280.	563.2	208.7	2.01	0.34	2.04	48.5	291.4	20.6	1.5E 06	3.1E-02	7.015	6.801	0.214	1.469	4.6[illegible]E 02
290.	583.3	208.7	2.01	0.33	2.04	48.5	291.4	20.6	1.5E 06	3.2E-02	7.017	6.801	0.216	1.471	4.6[illegible]E 02
300.	603.4	208.7	2.01	0.33	2.04	48.5	291.4	20.6	1.5E 06	3.2E-02	7.019	6.801	0.219	1.474	4.6[illegible]E 02
310.	623.6	208.7	2.01	0.33	2.04	48.5	291.4	20.6	1.5E 06	3.3E-02	7.021	6.800	0.221	1.476	4.6[illegible]E 02
320.	643.7	208.7	2.01	0.32	2.04	48.5	291.4	20.6	1.5E 06	3.3E-02	7.023	6.800	0.224	1.478	4.6[illegible]E 02
330.	663.8	208.7	2.01	0.32	2.04	48.5	291.4	20.6	1.5E 06	3.3E-02	7.025	6.799	0.226	1.480	4.6[illegible]E 02
340.	683.9	208.7	2.01	0.32	2.04	48.5	291.4	20.6	1.5E 06	3.4E-02	7.027	6.798	0.228	1.483	4.6[illegible]E 02
350.	704.0	208.7	2.01	0.31	2.04	48.5	291.4	20.6	1.5E 06	3.4E-02	7.028	6.797	0.231	1.484	4.6[illegible]E 02
360.	724.1	208.7	2.01	0.31	2.04	48.5	291.4	20.6	1.5E 06	3.4E-02	7.030	6.797	0.233	1.486	4.6[illegible]E 02
370.	744.3	208.7	2.01	0.31	2.04	48.5	291.4	20.6	1.5E 06	3.5E-02	7.031	6.796	0.236	1.488	4.6[illegible]E 02
380.	764.4	208.7	2.01	0.31	2.03	48.5	291.4	20.6	1.5E 06	3.5E-02	7.033	6.795	0.238	1.489	4.6[illegible]E 02
390.	784.5	208.7	2.01	0.30	2.03	48.5	291.4	20.6	1.5E 06	3.5E-02	7.034	6.794	0.241	1.490	4.6[illegible]E 02
400.	804.6	208.7	2.01	0.30	2.03	48.5	291.4	20.6	1.5E 06	3.6E-02	7.036	6.792	0.243	1.492	4.6[illegible]E 02
410.	824.7	208.7	2.01	0.30	2.03	48.5	291.4	20.6	1.5E 06	3.6E-02	7.037	6.791	0.246	1.493	4.6[illegible]E 02
420.	844.8	208.7	2.01	0.30	2.03	48.5	291.4	20.6	1.5E 06	3.7E-02	7.038	6.790	0.248	1.494	4.6[illegible]E 02
430.	864.9	208.7	2.01	0.29	2.03	48.5	291.4	20.6	1.5E 06	3.7E-02	7.039	6.789	0.250	1.495	4.6[illegible]E 02
440.	885.1	208.7	2.01	0.29	2.03	48.5	291.4	20.6	1.5E 06	3.7E-02	7.040	6.787	0.253	1.496	4.6[illegible]E 02
450.	905.2	208.7	2.01	0.29	2.03	48.5	291.4	20.6	1.5E 06	3.8E-02	7.041	6.786	0.255	1.497	4.6[illegible]E 02
460.	925.3	208.7	2.01	0.29	2.03	48.5	291.4	20.6	1.5E 06	3.8E-02	7.042	6.785	0.258	1.498	4.6[illegible]E 02
470.	945.4	208.7	2.01	0.29	2.03	48.5	291.4	20.6	1.5E 06	3.8E-02	7.043	6.783	0.260	1.499	4.6[illegible]E 02
480.	965.5	208.7	2.01	0.28	2.03	48.5	291.4	20.6	1.5E 06	3.9E-02	7.044	6.782	0.262	1.501	4.6[illegible]E 02
490.	985.6	208.7	2.01	0.28	2.03	48.5	291.4	20.6	1.5E 06	3.9E-02	7.045	6.780	0.265	1.501	4.6[illegible]E 02

Exhibit A-6 (continued)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 302.
SIGMA Y (M) = 79.
SIGMA Z (M) = 29.
SO2-SO4 CONVERSION RATE= 0.0000 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0000 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY DSP-TOTAL (UG/M3)	PRIMARY DSP-TOTAL (10-6 M-1)	DCPSH/DS (%)
H+2S												
INCREMENT!	3.904	0.103	0.000	4.751	0.000	0.799	0.000	0.000	-0.037	273.686	3.293	0.000
TOTAL AMB!	3.904	0.103	0.000	4.751	0.000	0.799	2.935	0.024	0.001	236.022	3.521	2.972
H+1S												
INCREMENT!	17.497	0.701	0.000	4.003	0.000	3.579	0.000	0.000	-0.037	1223.834	15.205	0.000
TOTAL AMB!	17.497	0.701	0.000	4.003	0.000	3.579	2.935	0.021	0.001	1236.823	15.334	0.565
H												
INCREMENT!	28.048	1.132	0.000	3.923	0.000	5.901	0.000	0.000	-0.037	2017.842	25.069	0.000
TOTAL AMB!	28.048	1.132	0.000	3.923	0.000	5.901	2.935	0.013	0.001	2030.773	25.198	0.891
H-1S												
INCREMENT!	17.497	0.701	0.000	4.003	0.000	3.579	0.000	0.000	-0.037	1223.831	15.205	0.000
TOTAL AMB!	17.497	0.701	0.000	4.003	0.000	3.579	2.935	0.021	0.001	1236.817	15.334	0.565
H-2S												
INCREMENT!	3.904	0.103	0.000	4.751	0.000	0.799	0.000	0.000	-0.037	273.685	3.293	0.000
TOTAL AMB!	3.904	0.103	0.000	4.751	0.000	0.799	2.935	0.024	0.001	286.021	3.521	2.972
0												
INCREMENT!	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AMB!	0.000	0.000	0.000	100.000	0.000	0.000	2.935	100.000	0.000	12.336	0.152	65.542

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-6 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RVO	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	30.	0.02	138.0	25.38	90.86	96.36	0.3429	0.3537	-14.04	-5.51	-0.1522	0.6672	0.0240	0.0227	22.5698	14.970
	30.	0.05	137.2	25.82	92.58	97.06	0.3377	0.3478	-12.33	-4.81	-0.1173	0.7495	0.0189	0.0168	17.7977	11.695
	30.	0.10	136.1	26.43	94.99	98.03	0.3316	0.3411	-9.92	-3.83	-0.0959	0.8429	0.0127	0.0100	12.1008	7.891
	30.	0.20	134.5	27.32	98.51	99.42	0.3[illegible]	0.3343	-6.40	-2.44	-0.0639	0.9340	0.0060	0.0032	5.8914	3.810
	30.	0.50	132.2	28.55	103.37	101.29	0.3[illegible]	0.3305	-1.54	-0.58	-0.0173	0.9757	0.0011	-0.0005	1.4077	1.000
	30.	0.80	148.1	19.95	104.80	101.83	0.3198	0.3309	-0.11	-0.04	-0.0035	0.9695	0.0009	-0.0001	0.9277	0.672
	45.	0.02	152.4	17.60	93.42	97.49	0.3386	0.3501	-11.49	-4.46	-0.1075	0.7152	0.0197	0.0191	18.5166	12.492
	45.	0.05	151.8	17.95	94.83	97.97	0.3344	0.3453	-10.08	-3.99	-0.0954	0.7854	0.0156	0.0142	14.9701	9.793
	45.	0.10	150.9	18.44	96.89	98.75	0.3295	0.3397	-8.11	-3.12	-0.0780	0.8552	0.0106	0.0087	10.2247	6.664
	45.	0.20	149.6	19.15	99.68	99.88	0.3240	0.3340	-5.23	-1.99	-0.0529	0.9434	0.0051	0.0029	4.9770	3.209
	45.	0.50	147.7	20.14	103.65	101.39	0.3198	0.3307	-1.26	-0.47	-0.0144	0.9890	0.0009	-0.0003	1.1569	0.731
	45.	0.80	148.2	19.88	104.82	101.83	0.3196	0.3310	-0.09	-0.03	-0.0023	0.9751	0.0003	-0.0001	0.7554	0.465
	60.	0.02	158.7	14.23	94.87	97.98	0.3360	0.3479	-10.04	-3.83	-0.0997	0.7455	0.0172	0.0169	16.7059	11.092
	60.	0.05	153.1	14.53	96.10	98.47	0.3325	0.3437	-8.81	-3.39	-0.0931	0.8031	0.0136	0.0127	13.2676	8.656
	60.	0.10	157.3	14.95	97.83	99.15	0.3282	0.3383	-7.08	-2.71	-0.0669	0.8794	0.0093	0.0078	9.0621	5.598
	60.	0.20	156.2	15.56	100.35	100.13	0.3234	0.3337	-4.56	-1.73	-0.0453	0.9494	0.0045	0.0027	4.4186	2.900
	60.	0.50	154.6	16.42	103.81	101.45	0.3197	0.3303	-1.10	-0.41	-0.0126	0.9825	0.0008	-0.0003	1.0168	0.715
	60.	0.80	154.1	16.68	104.83	101.84	0.3195	0.3310	-0.08	-0.03	-0.0023	0.9733	0.0007	-0.0001	0.6535	0.465
	90.	0.02	162.3	12.25	95.85	98.37	0.3343	0.3463	-9.06	-3.42	-0.0864	0.7670	0.0154	0.0153	15.1723	9.973
	90.	0.05	161.8	12.52	96.96	98.81	0.3312	0.3426	-7.95	-3.03	-0.0763	0.8363	0.0123	0.0115	12.0402	7.860
	90.	0.10	161.2	12.89	98.52	99.42	0.3273	0.3382	-6.39	-2.44	-0.0612	0.8995	0.0083	0.0071	8.2611	5.355
	90.	0.20	160.1	13.44	100.79	100.30	0.3230	0.3333	-4.12	-1.56	-0.0403	0.9536	0.0041	0.0025	4.0281	2.660
	90.	0.50	158.7	14.21	103.92	101.49	0.3196	0.3308	-0.99	-0.37	-0.0113	0.9842	0.0008	-0.0002	0.9135	0.666
	90.	0.80	158.3	14.45	104.84	101.84	0.3195	0.3310	-0.07	-0.03	-0.0022	0.9804	0.0006	-0.0001	0.5935	0.365
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.03	162.2	12.32	96.12	98.48	0.3335	0.3454	-8.78	-3.33	-0.0821	0.7319	0.0146	0.0143	14.3711	9.427
90.																
	30.	0.02	142.0	23.25	47.66	74.63	0.3252	0.3366	-11.83	-6.94	-0.2015	0.6938	0.0234	0.0234	20.5244	13.067
	30.	0.05	140.7	23.95	49.04	75.50	0.3192	0.3294	-10.45	-6.08	-0.1793	0.7685	0.0174	0.0161	15.7562	10.761
	30.	0.10	138.9	24.92	50.98	76.68	0.3124	0.3215	-8.51	-4.89	-0.1477	0.8226	0.0107	0.0083	10.2582	7.108
	30.	0.20	136.3	26.31	53.82	78.38	0.3055	0.3143	-5.66	-3.20	-0.1002	0.9368	0.0038	0.0011	4.6654	3.719
	30.	0.50	132.9	28.18	57.78	80.63	0.3014	0.3115	-1.70	-0.94	-0.0318	1.0102	-0.0004	-0.0017	1.3660	1.225
	30.	0.80	148.1	19.95	58.97	81.29	0.3017	0.3124	-0.52	-0.28	-0.0106	0.9918	-0.0001	-0.0003	0.5806	0.400
	45.	0.02	155.5	15.94	49.82	75.98	0.3209	0.3329	-9.66	-5.59	-0.1639	0.7383	0.0191	0.0197	17.2147	11.649
	45.	0.05	154.5	16.48	50.95	76.67	0.3162	0.3271	-8.54	-4.91	-0.1458	0.8176	0.0144	0.0139	13.2923	9.017
	45.	0.10	153.1	17.24	52.54	77.62	0.3108	0.3207	-6.95	-3.95	-0.1201	0.9054	0.0090	0.0074	8.7062	6.045
	45.	0.20	151.1	18.34	54.86	78.98	0.3051	0.3145	-4.62	-2.59	-0.0815	0.9859	0.0033	0.0013	3.9403	3.073
	45.	0.50	148.3	19.84	58.10	80.81	0.3015	0.3119	-1.39	-0.77	-0.0259	1.0030	-0.0003	-0.0013	1.0206	0.684
	45.	0.80	148.2	19.88	59.07	81.34	0.3017	0.3126	-0.42	-0.23	-0.0085	0.9933	-0.0001	-0.0006	0.4688	0.296
	60.	0.02	161.3	12.81	51.05	76.73	0.3184	0.3306	-8.44	-4.85	-0.1423	0.7665	0.0166	0.0174	15.2011	10.242
	60.	0.05	160.4	13.27	52.03	77.32	0.3144	0.3256	-7.45	-4.25	-0.1270	0.8366	0.0126	0.0124	11.7753	7.961
	60.	0.10	159.2	13.92	53.42	78.14	0.3097	0.3200	-6.07	-3.43	-0.1046	0.9144	0.0080	0.0063	7.7405	5.243
	60.	0.20	157.5	14.86	55.45	79.32	0.3048	0.3145	-4.03	-2.26	-0.0710	0.9861	0.0030	0.0013	3.5000	2.703
	60.	0.50	155.1	16.17	58.27	80.91	0.3015	0.3121	-1.21	-0.67	-0.0225	1.0068	-0.0002	-0.0011	0.9413	0.651
	60.	0.80	154.4	16.55	59.12	81.37	0.3017	0.3127	-0.37	-0.20	-0.0075	0.9942	-0.0000	-0.0003	0.4069	0.264
	90.	0.02	164.7	10.98	51.87	77.22	0.3167	0.3290	-7.61	-4.35	-0.1286	0.7866	0.0149	0.0157	13.8028	9.279
	90.	0.05	163.9	11.40	52.76	77.75	0.3131	0.3245	-6.73	-3.82	-0.1144	0.8502	0.0114	0.0113	10.7150	7.223
	90.	0.10	162.8	11.97	54.01	78.49	0.3090	0.3193	-5.47	-3.09	-0.0942	0.9210	0.0072	0.0062	7.0607	4.754
	90.	0.20	161.3	12.81	55.85	79.54	0.3045	0.3145	-3.64	-2.03	-0.0640	0.9866	0.0027	0.0013	3.1926	2.459
	90.	0.50	159.1	13.98	58.39	80.97	0.3016	0.3122	-1.09	-0.60	-0.0203	1.0061	-0.0002	-0.0010	0.8430	0.763
	90.	0.80	158.5	14.33	59.15	81.39	0.3017	0.3127	-0.33	-0.18	-0.0063	0.9947	-0.0000	-0.0003	0.3657	0.310
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	0.	0.03	164.5	11.09	52.09	77.35	0.3158	0.3278	-7.40	-4.22	-0.1251	0.8033	0.0140	0.0146	13.9365	8.765

Exhibit A-6 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 302.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RVO	RV	REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(530)	DRATIO	DELX	DELY	D(L'V)	D(LAB)
135.																
	30.	0.02	144.8	21.71	47.59	74.59	0.3219	0.3360	-16.60	-9.39	-0.2403	0.6032	0.0233	0.0251	23.1402	16.210
	30.	0.03	143.3	22.61	49.46	75.76	0.3148	0.3273	-14.53	-8.22	-0.2213	0.5921	0.0168	0.0164	17.4078	12.407
	30.	0.10	140.9	23.85	52.10	77.36	0.3072	0.3184	-11.90	-6.62	-0.1927	0.5126	0.0092	0.0076	11.0883	8.540
	30.	0.20	137.7	25.59	55.97	79.62	0.2999	0.3103	-8.02	-4.36	-0.1350	1.0211	0.0013	-0.0005	5.0668	4.531
	30.	0.50	133.4	27.92	61.39	82.60	0.2963	0.3062	-2.61	-1.37	-0.0417	1.0041	-0.0010	-0.0027	2.0258	1.764
	30.	0.80	143.1	19.95	63.03	83.47	0.2971	0.3096	-0.97	-0.50	-0.0152	1.0015	-0.0009	-0.0013	0.8242	0.760
	45.	0.02	157.7	14.75	50.60	76.46	0.3174	0.3319	-13.60	-7.52	-0.2019	0.7023	0.0193	0.0210	19.4681	13.474
	45.	0.03	156.4	15.44	53.13	77.38	0.3120	0.3251	-11.07	-6.60	-0.1709	0.6222	0.0139	0.0142	14.7072	10.243
	45.	0.10	154.7	16.40	56.23	78.65	0.3039	0.3173	-9.71	-5.33	-0.1485	0.5562	0.0079	0.0069	9.0258	6.873
	45.	0.20	152.1	17.77	57.45	80.45	0.2999	0.3111	-6.54	-3.53	-0.1016	1.0127	0.0013	0.0021	6.2156	5.363
	45.	0.50	149.7	19.63	61.87	82.86	0.2967	0.3083	-2.12	-1.12	-0.0330	1.0232	-0.0014	-0.0021	1.6560	1.413
	45.	0.80	149.2	19.83	63.21	83.57	0.2973	0.3099	-0.79	-0.41	-0.0120	1.0060	-0.0007	-0.0011	0.5988	0.603
	60.	0.02	163.2	11.89	52.36	77.48	0.3148	0.3294	-11.70	-6.50	-0.1739	0.7566	0.0167	0.0183	17.0711	11.707
	60.	0.03	162.1	12.39	53.64	78.27	0.3102	0.3236	-10.36	-5.71	-0.1567	0.8456	0.0122	0.0127	13.0220	9.139
	60.	0.10	160.6	13.20	55.52	79.36	0.3031	0.3172	-8.43	-4.62	-0.1294	0.9221	0.0070	0.0053	8.0366	6.456
	60.	0.20	158.4	14.38	58.28	80.91	0.2998	0.3113	-5.71	-3.06	-0.0885	1.0020	0.0017	0.0002	5.7870	5.271
	60.	0.50	155.4	15.98	62.14	83.01	0.2969	0.3091	-1.65	-0.97	-0.0295	1.0234	-0.0011	-0.0018	1.4218	1.231
	60.	0.80	154.6	16.46	63.31	83.62	0.2974	0.3100	-0.63	-0.36	-0.0113	1.0052	-0.0006	-0.0009	0.5622	0.533
	90.	0.02	166.3	10.09	53.44	78.16	0.3131	0.3276	-10.55	-5.32	-0.1535	0.7659	0.0150	0.0167	15.4223	10.653
	90.	0.03	165.4	10.61	54.65	78.86	0.3090	0.3223	-9.33	-5.12	-0.1412	0.8383	0.0110	0.0116	11.7655	8.226
	90.	0.10	164.0	11.33	56.35	79.83	0.3044	0.3168	-7.65	-4.15	-0.1166	0.9247	0.0064	0.0059	7.6016	5.877
	90.	0.20	162.1	12.33	58.85	81.22	0.2997	0.3114	-5.15	-3.75	-0.0793	1.0070	0.0016	0.0004	5.2013	5.043
	90.	0.50	159.4	13.81	62.33	83.10	0.2970	0.3093	-1.67	-0.83	-0.0255	1.0210	-0.0010	-0.0016	1.5693	1.324
	90.	0.80	158.7	14.24	63.33	83.66	0.2975	0.3101	-0.62	-0.32	-0.0102	1.0047	-0.0005	-0.0003	0.6170	0.477

OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE

	90.	0.03	166.1	10.22	53.74	78.33	0.3120	0.3263	-10.26	-5.65	-0.1562	0.8307	0.0160	0.0152	14.5092	10.077

Exhibit A-6 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.	30.	15.	2.95	70.49	87.25	0.3297	0.3406	28.89	16.63	0.6897	[illegible]	[illegible]	0.0494	53.0513	38.8955
	30.	30.	1.41	64.55	84.26	0.3339	0.3434	40.33	27.94	1.6658	[illegible]	0.0312	0.0366	57.6464	42.9662
	30.	45.	0.88	62.37	83.13	0.3361	0.3452	44.89	33.86	2.5199	0.1373	0.0261	0.0903	53.6923	46.8879
	30.	60.	0.69	61.33	82.57	0.3374	0.3462	46.57	37.23	3.1502	0.1379	0.0336	0.0934	59.2743	48.6411
	30.	75.	0.44	60.84	82.31	0.3381	0.3468	47.39	39.00	3.5654	0.1334	0.0393	0.0949	59.6157	49.7791
	30.	90.	0.39	60.69	82.23	0.3383	0.3470	47.77	39.55	3.7041	0.1321	0.0902	0.0934	59.7321	50.1066
	45.	15.	2.10	64.88	84.42	0.3204	0.3321	23.24	13.89	0.5558	0.2747	0.0396	0.0611	46.2716	30.5447
	45.	30.	1.04	56.92	80.16	0.3251	0.3348	32.72	23.83	1.2506	0.1995	0.0724	0.0759	49.0314	36.9753
	45.	45.	0.63	54.02	78.49	0.3290	0.3370	36.24	29.33	2.0382	0.1734	0.0709	0.0329	59.9903	40.8893
	45.	75.	0.42	52.01	77.30	0.3305	0.3390	38.67	33 99	2.8933	0.1556	0.0323	0.0372	51.9855	43.4521
	45.	90.	0.39	51.81	77.19	0.3308	0.3393	38.90	34.51	3.0121	0.1539	0.0327	0.0376	52.1057	43.7960
	60.	15.	1.73	61.75	82.89	0.3145	0.3264	20.15	12.18	0.4822	0.3083	0.0337	0.0554	41.4802	27.3617
	60.	30.	0.88	52.68	77.70	0.3194	0.3290	28.48	21.38	1.1751	0.2239	0.0667	0.0702	45.0363	33.8893
	60.	45.	0.60	49.34	75.63	0.3228	0.3316	31.57	26.42	1.7745	0.1933	0.0727	0.0769	46.3193	36.6277
	60.	60.	0.47	47.78	74.71	0.3247	0.3332	33.02	29.36	2.2353	0.1763	0.0759	0.0303	47.0945	38.5776
	60.	75.	0.41	47.04	74.24	0.3257	0.3340	33.70	30.93	2.5251	0.1720	0.0774	0.0321	47.4119	39.6838
	60.	90.	0.39	46.82	74.10	0.3261	0.3343	33.91	31.42	2.6239	0.1700	0.0779	0.0327	47.5373	39.9604
	90.	15.	1.51	59.70	81.69	0.3103	0.3223	13.10	11.07	0.4333	0.3353	0.0495	0.0513	33.6792	24.9540
	90.	30.	0.73	49.84	75.99	0.3152	0.3248	25.64	19.67	1.0573	0.2439	0.0625	0.0659	41.6583	30.7754
	90.	45.	0.55	46.21	73.71	0.3189	0.3276	28.44	24.45	1.5981	0.2095	0.0683	0.0729	43.0124	33.9020
	90.	60.	0.45	44.51	72.59	0.3210	0.3293	29.75	27.25	2.0134	0.1982	0.0722	0.0766	43.7683	35.0939
	90.	75.	0.41	43.71	72.06	0.3222	0.3303	30.37	28.75	2.2747	0.1654	0.0739	0.0784	44.1807	36.9298
	90.	90.	0.39	43.47	71.90	0.3225	0.3306	30.56	29.22	2.3633	0.1631	0.0744	0.0790	44.3163	37.2594
90.	30.	15.	2.95	36.94	67.26	0.3110	0.3217	10.60	8.07	0.3931	0.2631	0.0612	0.0650	40.2775	26.4156
	30.	30.	1.41	33.12	64.29	0.3153	0.3245	17.73	18.09	1.1406	0.1954	0.0731	0.0799	41.2626	30.9156
	30.	45.	0.83	31.71	63.13	0.3178	0.3264	20.39	22.98	1.7373	0.1713	0.0781	0.0360	41.2162	33.3593
	30.	60.	0.60	31.04	62.57	0.3192	0.3276	21.64	25.78	2.2344	0.1602	0.0306	0.0391	41.2762	34.8645
	30.	75.	0.44	30.72	62.30	0.3200	0.3283	22.22	27.25	2.5961	0.1543	0.0319	0.0906	41.3755	35.7024
	30.	90.	0.39	30.62	62.22	0.3202	0.3285	22.39	27.72	2.7022	0.1532	0.0323	0.0911	41.4205	35.9793
	45.	15.	2.10	34.75	65.58	0.3018	0.3129	8.42	7.20	0.3129	0.3160	0.0520	0.0562	34.4165	22.4531
	45.	30.	1.04	29.73	61.45	0.3062	0.3152	14.34	13.25	0.9222	0.2331	0.0640	0.0706	35.3476	26.4371
	45.	45.	0.68	27.87	59.81	0.3092	0.3174	16.56	19.66	1.4499	0.2026	0.0695	0.0770	35.4254	28.7237
	45.	60.	0.51	27.00	59.01	0.3110	0.3189	17.60	22.21	1.8555	0.1834	0.0724	0.0303	35.5494	30.1464
	45.	75.	0.42	26.59	58.62	0.3120	0.3197	18.09	23.58	2.1104	0.1816	0.0739	0.0320	35.6563	30.9377
	45.	90.	0.39	26.46	58.51	0.3122	0.3199	18.23	24.01	2.1974	0.1795	0.0743	0.0323	35.7133	31.1924
	60.	15.	1.73	33.59	64.66	0.2961	0.3072	7.23	6.28	0.2700	0.3534	0.0463	0.0503	39.7205	19.2924
	60.	30.	0.88	27.85	59.79	0.3004	0.3091	12.46	13.59	0.8014	0.2616	0.0532	0.0645	31.7232	23.7155
	60.	45.	0.69	25.73	57.81	0.3038	0.3116	14.41	17.67	1.2617	0.2263	0.0641	0.0711	31.9256	25.9219
	60.	60.	0.47	24.74	56.85	0.3058	0.3132	15.33	20.06	1.6156	0.2094	0.0672	0.0747	32.1157	27.3027
	60.	75.	0.41	24.27	56.39	0.3069	0.3141	15.77	21.34	1.8382	0.2014	0.0683	0.0763	32.2626	28.0712
	60.	90.	0.39	24.12	56.25	0.3072	0.3144	15.89	21.75	1.9142	0.1990	0.0693	0.0770	32.3171	28.3166
	90.	15.	1.51	32.82	64.05	0.2920	0.3030	6.49	5.66	0.2418	0.3351	0.0422	0.0463	23.0989	15.2551
	90.	30.	0.78	26.60	58.64	0.2962	0.3046	11.21	12.44	0.7209	0.2843	0.0549	0.0600	29.1640	21.8913
	90.	45.	0.55	24.30	56.42	0.2998	0.3072	12.98	16.27	1.1360	0.2456	0.0601	0.0668	29.4693	23.9485
	90.	60.	0.45	23.22	55.33	0.3020	0.3090	13.81	18.54	1.4551	0.2266	0.0534	0.0705	29.7021	25.2984
	90.	75.	0.41	22.71	54.81	0.3031	0.3100	14.21	19.76	1.6559	0.2174	0.0651	0.0724	29.8734	26.0706
	90.	90.	0.39	22.56	54.65	0.3035	0.3104	14.33	20.15	1.7244	0.2147	0.0656	0.0739	29.9350	26.2023

Exhibit A-6 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.															
	30.	15.	2.93	36.68	67.07	0.3064	0.3199	6.19	4.96	0.2202	0.3377	0.0586	0.0647	42.1500	26.6624
	30.	30.	1.41	32.19	63.53	0.3112	0.3232	14.34	14.17	0.0360	0.2000	0.0711	0.0803	42.4001	30.1771
	30.	45.	0.83	30.53	62.14	0.3141	0.3256	17.39	19.12	1.3696	0.1739	0.0765	0.0869	41.7653	32.1404
	30.	60.	0.60	29.74	61.46	0.3159	0.3271	18.82	21.96	1.7790	0.1617	0.0793	0.0903	41.4362	33.4023
	30.	75.	0.44	29.36	61.13	0.3168	0.3280	19.48	23.46	2.0356	0.1558	0.0807	0.0920	41.3573	34.1252
	30.	90.	0.39	29.24	61.03	0.3171	0.3283	19.68	23.93	2.1229	0.1540	0.0812	0.0926	41.3411	34.3627
	45.	15.	2.10	35.24	65.96	0.2968	0.3105	4.73	3.86	0.1714	0.3321	0.0491	0.0553	35.9706	22.6579
	45.	30.	1.04	29.40	61.16	0.3014	0.3129	11.54	11.80	0.6738	0.2420	0.0613	0.0700	36.2056	25.6073
	45.	45.	0.68	27.23	59.22	0.3048	0.3156	14.09	16.20	1.1094	0.2090	0.0671	0.0768	35.7602	27.5203
	45.	60.	0.51	26.21	58.27	0.3068	0.3173	15.29	18.77	1.4442	0.1933	0.0703	0.0805	35.5462	28.7124
	45.	75.	0.42	25.73	57.81	0.3079	0.3183	15.83	20.15	1.6546	0.1853	0.0719	0.0823	35.4439	29.6121
	45.	90.	0.39	25.59	57.68	0.3083	0.3186	16.02	20.58	1.7263	0.1836	0.0724	0.0829	32.0235	20.1223
	60.	15.	1.73	34.52	65.40	0.2909	0.3045	4.03	3.29	0.1463	0.3727	0.0432	0.0493	32.0733	22.9643
	60.	30.	0.88	27.87	59.80	0.2952	0.3062	10.01	10.44	0.5847	0.2739	0.0551	0.0633	32.1025	24.7210
	60.	45.	0.60	25.40	57.50	0.2989	0.3090	12.25	14.48	0.9649	0.2356	0.0612	0.0703	31.9823	25.8341
	60.	60.	0.47	24.24	56.36	0.3011	0.3110	13.31	16.06	1.2372	0.2171	0.0645	0.0741	31.9382	26.5463
	60.	75.	0.41	23.69	55.81	0.3023	0.3120	13.81	18.15	1.4411	0.2032	0.0663	0.0761	31.9378	26.7616
	60.	90.	0.39	23.53	55.65	0.3027	0.3124	13.96	18.55	1.5038	0.2055	0.0668	0.0767	31.9373	26.8031
	90.	15.	1.51	34.06	65.04	0.2869	0.3001	3.57	2.93	0.1302	0.4646	0.0391	0.0449	29.2305	18.3931
	90.	30.	0.78	26.83	58.87	0.2909	0.3014	8.99	9.51	0.5256	0.2997	0.0507	0.0583	29.6660	21.0121
	90.	45.	0.55	24.18	56.30	0.2946	0.3043	11.03	13.28	0.8635	0.2573	0.0569	0.0655	29.5210	22.7523
	90.	60.	0.45	22.92	55.03	0.2969	0.3063	11.99	15.53	1.1322	0.2365	0.0604	0.0695	29.4727	23.8250
	90.	75.	0.41	22.33	54.41	0.2982	0.3074	12.43	16.74	1.2981	0.2264	0.0622	0.0715	29.4497	24.5460
	90.	90.	0.39	22.15	54.22	0.2987	0.3078	12.58	17.13	1.3543	0.2233	0.0627	0.0721	29.5002	24.7576

Exhibit A-6 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0

THETA = 43.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	94.59	97.87	0.3376	0.3479	-3.42	-1.36	-0.0329	0.9323	0.0057	0.0057	5.3636	3.6632
1.0	0.02	0.05	92.56	97.05	0.3405	0.3504	-6.36	-2.53	-0.0609	0.8581	0.0109	0.0109	10.2366	6.9544
1.0	0.02	0.10	93.26	97.34	0.3389	0.3488	-6.94	-2.74	-0.0656	0.8266	0.0122	0.0123	11.7232	7.9166
1.0	0.02	0.20	94.29	97.75	0.3370	0.3472	-7.77	-3.04	-0.0724	0.7992	0.0137	0.0142	13.4252	8.9031
1.0	0.02	0.50	95.71	98.32	0.3355	0.3463	-8.92	-3.44	-0.0818	0.7853	0.0147	0.0152	14.6919	9.7756
1.0	0.02	0.80	96.13	98.49	0.3355	0.3464	-9.26	-3.56	-0.0846	0.7852	0.0148	0.0151	14.7432	9.8229
1.0	0.05	0.05	93.90	98.40	0.3339	0.3436	-3.02	-1.19	-0.0290	0.9566	0.0044	0.0042	4.1692	2.8093
1.0	0.05	0.10	94.37	97.78	0.3355	0.3449	-5.83	-2.29	-0.0556	0.8939	0.0089	0.0086	8.4374	5.7090
1.0	0.05	0.20	95.40	98.19	0.3337	0.3433	-6.67	-2.60	-0.0626	0.8606	0.0104	0.0104	10.2216	6.8932
1.0	0.05	0.50	96.82	98.76	0.3324	0.3425	-7.81	-3.00	-0.0722	0.8440	0.0115	0.0114	11.3397	7.6443
1.0	0.05	0.80	97.24	98.93	0.3323	0.3427	-8.15	-3.12	-0.0751	0.8439	0.0116	0.0114	11.6034	7.8099
1.0	0.05	0.80	97.24	98.93	0.3323	0.3427	-8.15	-3.12	-0.0751	0.8439	0.0116	0.0114	11.6034	7.8099
1.0	0.10	0.10	97.74	99.12	0.3295	0.3387	-2.45	-0.95	-0.0233	0.9799	0.0028	0.0025	2.7530	1.8333
1.0	0.10	0.20	96.95	98.81	0.3298	0.3388	-5.11	-1.98	-0.0483	0.9306	0.0064	0.0059	6.3323	4.2399
1.0	0.10	0.50	98.38	99.37	0.3285	0.3381	-6.25	-2.39	-0.0565	0.9111	0.0077	0.0070	7.7096	5.1077
1.0	0.10	0.80	98.80	99.53	0.3285	0.3383	-6.59	-2.51	-0.0615	0.9103	0.0078	0.0070	7.7936	5.1636
1.0	0.10	0.80	98.80	99.53	0.3285	0.3383	-6.59	-2.51	-0.0615	0.9103	0.0078	0.0070	7.7936	5.1636
1.0	0.20	0.20	100.43	100.17	0.3245	0.3337	-1.63	-0.62	-0.0156	0.9989	0.0012	0.0008	1.2171	0.8700
1.0	0.20	0.50	100.65	100.25	0.3241	0.3335	-3.98	-1.51	-0.0379	0.9771	0.0033	0.0024	3.4923	2.3513
1.0	0.20	0.80	101.07	100.41	0.3241	0.3337	-4.32	-1.63	-0.0411	0.9767	0.0034	0.0024	3.5231	2.3673
1.0	0.50	0.50	104.14	101.58	0.3208	0.3309	-0.49	-0.18	-0.0047	1.0059	-0.0001	-0.0002	0.2213	0.2964
1.0	0.50	0.80	104.20	101.60	0.3207	0.3309	-1.19	-0.45	-0.0116	1.0033	-0.0000	-0.0003	0.5224	0.6929
1.0	0.80	0.80	105.24	101.99	0.3206	0.3312	-0.15	-0.06	-0.0014	1.0027	-0.0001	-0.0001	0.1105	0.0826
0.3	0.02	0.02	47.34	74.43	0.3280	0.3368	12.38	8.68	0.3527	0.8640	0.0083	0.0074	9.0983	9.2234
0.3	0.02	0.05	61.00	82.39	0.3293	0.3386	18.21	10.96	0.4257	0.6763	0.0206	0.0198	17.6463	14.1630
0.3	0.02	0.10	67.19	85.61	0.3259	0.3363	13.30	7.20	0.2473	0.6309	0.0240	0.0237	19.5151	13.5702
0.3	0.02	0.20	76.43	90.08	0.3243	0.3364	6.00	2.85	0.0861	0.6387	0.0238	0.0236	20.5171	12.9557
0.3	0.02	0.50	89.86	95.94	0.3288	0.3420	-4.47	-1.82	-0.0463	0.7124	0.0182	0.0136	18.0244	11.2728
0.3	0.02	0.80	94.16	97.70	0.3325	0.3450	-7.77	-3.04	-0.0745	0.7317	0.0166	0.0163	16.0398	10.3756
0.3	0.05	0.05	53.82	78.37	0.3186	0.3275	11.03	6.94	0.2561	0.8327	0.0098	0.0038	9.0114	7.8326
0.3	0.05	0.10	68.39	86.17	0.3218	0.3314	14.41	7.75	0.2661	0.6677	0.0199	0.0138	16.4198	11.9236
0.3	0.05	0.20	77.56	90.59	0.3208	0.3321	7.10	3.36	0.1093	0.6396	0.0202	0.0193	17.2544	10.9149
0.3	0.05	0.50	90.97	96.40	0.3256	0.3381	-3.36	-1.37	-0.0357	0.7656	0.0160	0.0147	14.8372	9.4307

Exhibit A-6 (continued)

0.3	0.05	0.00	95.27	98.14	0.3293	0.3412	-6.66	-2.60	-0.0647	0.8979	0.0135	0.0125	12.9475	8.2445
0.3	0.10	0.10	63.01	83.46	0.3110	0.3205	9.11	5.04	0.1662	0.8396	0.0221	0.0090	7.7014	6.1873
0.3	0.10	0.20	79.12	91.39	0.3165	0.3271	8.66	4.06	0.1206	0.7472	0.0160	0.0143	13.4670	8.7383
0.3	0.10	0.50	92.53	97.04	0.3217	0.3336	-1.80	-0.73	-0.0235	0.8250	0.0121	0.0102	11.0367	6.5923
0.3	0.10	0.80	96.83	98.76	0.3255	0.3368	-5.10	-1.98	-0.0507	0.8716	0.0096	0.0081	9.1350	5.7131
0.3	0.20	0.20	76.69	92.19	0.3071	0.3182	6.24	2.96	0.0861	0.8773	0.0066	0.0054	5.5962	4.0390
0.3	0.20	0.50	94.80	97.96	0.3174	0.3290	0.47	0.19	0.0021	0.8832	0.0078	0.0056	6.7423	3.9125
0.3	0.20	0.80	99.10	99.65	0.3212	0.3322	-2.83	-1.09	-0.0297	0.9343	0.0053	0.0034	4.5496	2.9319
0.3	0.50	0.50	96.38	98.59	0.3122	0.3250	2.05	0.82	0.0193	0.9433	0.0026	0.0017	2.2103	1.4361
0.3	0.50	0.80	102.22	100.83	0.3178	0.3294	0.30	0.11	0.0006	0.9639	0.0020	0.0007	1.6730	0.9555
0.3	0.80	0.80	102.62	101.00	0.3169	0.3292	0.69	0.26	0.0057	0.9769	0.0010	0.0003	0.8329	0.5528
0.0	0.02	0.02	27.09	59.09	0.3147	0.3216	19.15	25.18	2.3831	0.3416	0.0481	0.0462	28.2218	27.0021
0.0	0.02	0.05	47.47	74.51	0.3206	0.3293	20.74	24.11	1.5293	0.3343	0.0506	0.0493	33.9342	28.9238
0.0	0.02	0.10	56.02	79.64	0.3172	0.3279	21.97	14.61	0.6391	0.4118	0.0419	0.0408	29.9917	22.0716
0.0	0.02	0.20	68.81	85.42	0.3172	0.3303	11.90	6.27	0.2066	0.5176	0.0325	0.0314	26.2503	16.8152
0.0	0.02	0.50	87.36	94.90	0.3256	0.3400	-2.56	-1.07	-0.0287	0.6742	0.0214	0.0203	19.7343	12.1242
0.0	0.02	0.80	93.31	97.36	0.3312	0.3444	-7.13	-2.81	-0.0769	0.7361	0.0174	0.0168	16.7061	10.6624
0.0	0.05	0.05	35.78	66.38	0.3027	0.3107	17.05	13.98	0.8977	0.4796	0.0326	0.0307	20.6131	18.1543
0.0	0.05	0.10	57.13	80.27	0.3128	0.3225	23.08	15.24	0.6583	0.4393	0.0373	0.0353	26.8959	20.6022
0.0	0.05	0.20	69.92	86.97	0.3136	0.3250	13.01	6.82	0.2241	0.5394	0.0288	0.0269	23.0327	14.9760
0.0	0.05	0.50	88.47	93.36	0.3224	0.3361	-1.45	-0.61	-0.0176	0.7244	0.0182	0.0164	16.5678	10.0131
0.0	0.05	0.80	94.42	97.80	0.3280	0.3406	-6.02	-2.37	-0.0691	0.7909	0.0143	0.0130	13.5677	8.5172
0.0	0.10	0.10	40.12	74.92	0.2964	0.3062	14.07	9.89	0.4031	0.6198	0.0211	0.0191	14.6374	11.9817
0.0	0.10	0.20	71.47	87.73	0.3092	0.3207	14.56	7.58	0.2491	0.6065	0.0245	0.0218	19.3725	13.0294
0.0	0.10	0.50	90.03	96.01	0.3186	0.3316	0.10	0.04	-0.0013	0.7814	0.0144	0.0119	13.7611	7.5485
0.0	0.10	0.80	95.98	98.43	0.3242	0.3361	-4.47	-1.75	-0.0459	0.8332	0.0103	0.0086	9.7654	5.9215
0.0	0.20	0.20	66.52	85.28	0.2967	0.3069	9.61	5.13	0.1634	0.7643	0.0119	0.0109	9.2720	6.8034
0.0	0.20	0.50	92.30	96.95	0.3143	0.3269	2.38	0.98	0.0219	0.8370	0.0101	0.0072	8.5973	5.0251
0.0	0.20	0.80	98.25	99.32	0.3199	0.3315	-2.19	-0.85	-0.0246	0.9144	0.0062	0.0039	5.5075	3.2986
0.0	0.50	0.50	93.06	97.23	0.3081	0.3223	3.14	1.29	0.0319	0.9166	0.0039	0.0026	3.3593	2.1937
0.0	0.50	0.80	101.38	100.53	0.3166	0.3288	0.93	0.36	0.0061	0.9430	0.0029	0.0012	2.4213	1.4274
0.0	0.80	0.80	101.50	100.58	0.3153	0.3284	1.06	0.41	0.0039	0.9644	0.0016	0.0008	1.3352	0.8339

Exhibit A-6 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	81.48	92.35	0.3374	0.3478	-13.10	-5.51	-0.1371	0.9843	0.0039	0.0042	6.4764	5.9714
1.0	0.02	0.05	69.59	86.81	0.3393	0.3489	-21.24	-9.54	-0.2320	0.9803	0.0063	0.0068	10.0764	10.1814
1.0	0.02	0.10	66.57	85.30	0.3379	0.3467	-18.89	-8.79	-0.2191	0.9632	0.0064	0.0073	10.3968	9.5783
1.0	0.02	0.20	62.02	82.94	0.3348	0.3423	-15.36	-7.57	-0.1962	0.9349	0.0071	0.0086	10.0456	8.8164
1.0	0.02	0.50	55.29	79.23	0.3260	0.3340	-10.19	-5.52	-0.1530	0.8752	0.0104	0.0126	11.3230	8.5540
1.0	0.02	0.80	53.07	77.94	0.3211	0.3306	-8.51	-4.77	-0.1363	0.8395	0.0127	0.0146	12.6181	8.9102
1.0	0.05	0.05	79.18	91.32	0.3351	0.3443	-11.64	-5.02	-0.1271	1.0230	0.0021	0.0022	5.3329	5.1595
1.0	0.05	0.10	67.46	85.75	0.3345	0.3426	-10.00	-8.34	-0.2091	1.0464	0.0030	0.0032	8.7302	8.5193
1.0	0.05	0.20	62.91	83.41	0.3312	0.3382	-14.48	-7.10	-0.1852	1.0129	0.0035	0.0044	7.9445	7.5015
1.0	0.05	0.50	56.18	79.73	0.3224	0.3296	-9.30	-5.01	-0.1400	0.9471	0.0067	0.0082	8.4224	6.6873
1.0	0.05	0.80	53.96	78.46	0.3175	0.3262	-7.62	-4.25	-0.1225	0.9081	0.0091	0.0102	9.5349	6.8947
1.0	0.10	0.10	75.88	89.81	0.3314	0.3391	-9.58	-4.27	-0.1112	1.0633	-0.0001	-0.0003	4.2755	4.2748
1.0	0.10	0.20	64.16	84.06	0.3269	0.3333	-13.22	-6.44	-0.1695	1.1010	-0.0007	-0.0005	6.4347	6.4475
1.0	0.10	0.50	57.43	80.44	0.3181	0.3246	-8.05	-4.31	-0.1214	1.0279	0.0024	0.0032	5.2745	4.7361
1.0	0.10	0.80	55.21	79.18	0.3133	0.3212	-6.37	-3.52	-0.1028	0.9843	0.0048	0.0051	5.9783	4.6203
1.0	0.20	0.20	70.87	87.43	0.3250	0.3312	-6.51	-3.07	-0.0833	1.0932	-0.0027	-0.0027	3.7022	3.3460
1.0	0.20	0.50	59.27	81.45	0.3134	0.3196	-6.22	-3.29	-0.0935	1.1045	-0.0023	-0.0018	3.4208	3.3691
1.0	0.20	0.80	57.05	80.22	0.3087	0.3162	-4.53	-2.48	-0.0732	1.0568	0.0002	0.0002	2.5959	2.5169
1.0	0.50	0.50	63.39	83.66	0.3126	0.3191	-2.10	-1.09	-0.0304	1.0709	-0.0030	-0.0023	2.3993	1.6750
1.0	0.50	0.80	59.59	81.63	0.3056	0.3138	-1.99	-1.07	-0.0307	1.0811	-0.0029	-0.0022	2.2020	1.5662
1.0	0.80	0.80	60.88	82.33	0.3069	0.3151	-0.70	-0.37	-0.0100	1.0389	-0.0015	-0.0009	1.1194	0.7160
0.3	0.02	0.02	34.24	65.18	0.3242	0.3326	2.70	2.19	0.0828	1.0371	0.0013	0.0006	2.2669	2.2227
0.3	0.02	0.05	38.02	68.06	0.3211	0.3293	3.33	2.53	0.0931	0.8967	0.0089	0.0092	6.0922	4.4790
0.3	0.02	0.10	40.50	69.85	0.3166	0.3254	1.34	0.96	0.0331	0.8006	0.0140	0.0153	10.0540	6.6111
0.3	0.02	0.20	44.18	72.37	0.3129	0.3230	-1.60	-1.05	-0.0350	0.7532	0.0171	0.0188	13.7197	8.7658
0.3	0.02	0.50	49.45	75.75	0.3134	0.3254	-5.74	-3.42	-0.1043	0.7641	0.0167	0.0179	14.8775	9.6590
0.3	0.02	0.80	51.10	76.76	0.3155	0.3276	-7.02	-4.06	-0.1211	0.7820	0.0156	0.0165	14.2487	9.4519
0.3	0.05	0.05	37.09	67.38	0.3144	0.3218	2.41	1.84	0.0669	1.0002	0.0022	0.0017	2.0309	1.9477
0.3	0.05	0.10	41.39	70.47	0.3122	0.3199	2.23	1.58	0.0547	0.8781	0.0095	0.0098	6.6555	4.4402
0.3	0.05	0.20	45.07	72.96	0.3090	0.3181	-0.71	-0.46	-0.0165	0.8181	0.0132	0.0139	10.3703	6.5137
0.3	0.05	0.50	50.34	76.30	0.3099	0.3209	-4.85	-2.87	-0.0890	0.8259	0.0132	0.0134	11.7125	7.5315
0.3	0.05	0.80	51.99	77.29	0.3119	0.3232	-6.13	-3.53	-0.1066	0.8452	0.0120	0.0121	11.1334	7.3722
0.3	0.10	0.10	41.14	70.30	0.3051	0.3122	1.99	1.41	0.0488	0.9803	0.0025	0.0021	1.9939	1.6226
0.3	0.10	0.20	46.32	73.78	0.3044	0.3126	0.55	0.35	0.0099	0.8899	0.0086	0.0084	6.4469	3.9753
0.3	0.10	0.50	51.59	77.05	0.3057	0.3159	-3.60	-2.11	-0.0672	0.8945	0.0090	0.0083	7.9385	5.0358
0.3	0.10	0.80	53.24	78.04	0.3078	0.3181	-4.88	-2.79	-0.0859	0.9155	0.0079	0.0070	7.4294	4.9517
0.3	0.20	0.20	47.13	74.30	0.2980	0.3060	1.36	0.87	0.0282	0.9746	0.0022	0.0018	1.5258	1.1567
0.3	0.20	0.50	53.42	78.14	0.3012	0.3109	-1.77	-1.03	-0.0345	0.9577	0.0045	0.0033	3.8116	2.3668
0.3	0.20	0.80	55.07	79.10	0.3033	0.3132	-3.05	-1.72	-0.0549	0.9806	0.0034	0.0021	3.4202	2.3947
0.3	0.50	0.50	55.63	79.42	0.2976	0.3082	0.44	0.25	0.0072	0.9859	0.0010	0.0006	0.6571	0.4491

Exhibit A-6 (continued)

0.3	0.50	0.30	57.62	80.54	0.3004	0.3109	-0.50	-0.28	-0.0101	0.9997	0.0005	-0.0002	0.5720	0.4313
0.3	0.80	0.30	53.27	89.91	0.3003	0.3113	0.15	0.03	0.0021	0.9993	0.0004	0.0002	0.2743	0.1727
0.0	0.02	0.02	13.99	43.25	0.2955	0.2999	9.47	13.91	2.0627	0.3631	0.0469	0.0452	19.3523	19.9205
0.0	0.02	0.05	24.49	56.61	0.3015	0.3083	13.86	17.62	1.2831	0.8543	0.0469	0.0469	23.5033	21.0513
0.0	0.02	0.10	29.33	61.10	0.2982	0.3071	10.01	10.01	0.5087	0.4343	0.0336	0.0405	21.7037	16.2222
0.0	0.02	0.20	36.54	66.96	0.2985	0.3101	4.31	3.39	0.1583	0.5403	0.0301	0.0314	20.5627	13.1119
0.0	0.02	0.50	46.94	74.18	0.3073	0.3213	-3.64	-2.39	-0.0779	0.6932	0.0204	0.0203	17.0631	10.6159
0.0	0.02	0.80	50.25	76.24	0.3129	0.3263	-6.38	-3.75	-0.1142	0.7522	0.0169	0.0174	15.0456	9.7514
0.0	0.05	0.05	19.06	50.79	0.2835	0.2834	8.43	11.80	0.7770	0.5949	0.0239	0.0291	13.7719	13.0794
0.0	0.05	0.10	30.22	61.87	0.2934	0.3009	10.90	10.78	0.5525	0.4732	0.0338	0.0344	13.8263	14.8293
0.0	0.05	0.20	37.43	67.62	0.2946	0.3050	5.20	4.06	0.1550	0.5071	0.0261	0.0263	17.3509	11.2931
0.0	0.05	0.50	47.83	74.74	0.3038	0.3168	-2.95	-1.82	-0.0614	0.7437	0.0169	0.0163	13.9003	8.5097
0.0	0.05	0.80	51.14	76.79	0.3094	0.3218	-5.49	-3.21	-0.0993	0.8123	0.0134	0.0130	11.9339	7.6645
0.0	0.10	0.10	26.25	53.31	0.2778	0.2843	6.94	7.22	0.3506	0.6497	0.0183	0.0178	9.7729	8.5185
0.0	0.10	0.20	38.68	63.54	0.2901	0.2994	6.45	4.98	0.1922	0.6375	0.0216	0.0207	13.0230	9.3504
0.0	0.10	0.50	49.08	75.52	0.2997	0.3117	-1.69	-1.04	-0.0373	0.8393	0.0128	0.0112	10.1712	6.0525
0.0	0.10	0.80	52.39	77.54	0.3053	0.3168	-4.24	-2.46	-0.0782	0.8799	0.0093	0.0079	8.2239	5.2027
0.0	0.20	0.20	36.96	67.27	0.2736	0.2879	4.73	3.71	0.1415	0.7379	0.0102	0.0092	6.2293	4.8735
0.0	0.20	0.50	50.92	76.65	0.2954	0.3067	0.14	0.09	-0.0025	0.8651	0.0093	0.0063	6.1969	3.5754
0.0	0.20	0.80	54.23	78.61	0.3009	0.3118	-2.41	-1.38	-0.0464	0.9415	0.0050	0.0040	4.2953	2.6822
0.0	0.50	0.50	52.31	77.49	0.2903	0.3029	1.53	0.92	0.0276	0.9264	0.0034	0.0024	2.2303	1.5365
0.0	0.50	0.80	56.77	80.07	0.2981	0.3097	0.14	0.08	-0.0007	0.9539	0.0021	0.0003	1.4072	0.8765
0.0	0.80	0.80	57.15	80.28	0.2973	0.3096	0.51	0.29	0.0077	0.9683	0.0013	0.0003	0.9130	0.5791

Exhibit A-6 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 1.0
THETA = 135.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	81.19	92.22	0.3366	0.3473	-13.72	-5.78	-0.1401	0.9867	0.0037	0.0044	6.7125	6.2337
1.0	0.02	0.05	69.08	85.55	0.3376	0.3480	-22.52	-10.10	-0.2385	0.9787	0.0062	0.0075	11.5595	10.0259
1.0	0.02	0.10	66.40	85.21	0.3354	0.3452	-20.45	-9.47	-0.2277	0.9844	0.0067	0.0084	11.4813	10.4574
1.0	0.02	0.20	62.36	83.12	0.3312	0.3403	-17.34	-8.44	-0.2090	0.9896	0.0079	0.0103	11.6740	10.0645
1.0	0.02	0.50	56.35	79.83	0.3217	0.3319	-12.73	-6.73	-0.1753	0.9926	0.0113	0.0142	13.4221	10.1356
1.0	0.02	0.80	54.35	78.68	0.3169	0.3288	-11.22	-6.11	-0.1627	0.9897	0.0134	0.0159	14.6036	10.4296
1.0	0.05	0.05	79.40	91.42	0.3331	0.3426	-12.20	-5.24	-0.1292	1.0289	0.0017	0.0021	5.5011	5.3610
1.0	0.05	0.10	67.61	85.82	0.3313	0.3402	-19.25	-8.86	-0.2148	1.0473	0.0026	0.0035	9.3039	9.0725
1.0	0.05	0.20	63.57	83.75	0.3270	0.3353	-16.13	-7.80	-0.1950	1.0030	0.0037	0.0052	8.9701	8.3604
1.0	0.05	0.50	57.56	80.51	0.3175	0.3268	-11.53	-6.05	-0.1591	0.9424	0.0072	0.0091	9.9533	7.9154
1.0	0.05	0.80	55.56	79.38	0.3128	0.3236	-10.01	-5.41	-0.1457	0.9070	0.0093	0.0108	10.9539	8.0776
1.0	0.10	0.10	76.82	90.25	0.3280	0.3362	-10.04	-4.44	-0.1121	1.0706	-0.0007	-0.0006	4.4553	4.4426
1.0	0.10	0.20	65.27	84.63	0.3221	0.3296	-14.43	-6.92	-0.1749	1.1057	-0.0012	-0.0004	6.9562	6.9370
1.0	0.10	0.50	59.26	81.45	0.3127	0.3211	-9.83	-5.11	-0.1360	1.0310	0.0024	0.0034	6.2241	5.5902
1.0	0.10	0.80	57.25	80.34	0.3080	0.3180	-8.31	-4.45	-0.1215	0.9912	0.0046	0.0051	6.8533	5.4687
1.0	0.20	0.20	72.87	88.40	0.3202	0.3271	-6.82	-3.16	-0.0827	1.0990	-0.0032	-0.0029	3.9444	3.4361
1.0	0.20	0.50	61.75	82.89	0.3076	0.3156	-7.33	-3.76	-0.1015	1.1127	-0.0027	-0.0020	3.9730	3.8431
1.0	0.20	0.80	59.75	81.72	0.3031	0.3125	-5.82	-3.07	-0.0852	1.0679	-0.0004	-0.0003	3.1271	3.0855
1.0	0.50	0.50	66.89	85.46	0.3072	0.3153	-2.20	-1.10	-0.0294	1.0727	-0.0032	-0.0024	2.5072	1.7201
1.0	0.50	0.80	63.23	83.58	0.3003	0.3104	-2.34	-1.21	-0.0329	1.0870	-0.0032	-0.0024	2.4369	1.7583
1.0	0.80	0.80	64.84	84.41	0.3019	0.3119	-0.73	-0.38	-0.0095	1.0395	-0.0016	-0.0009	1.1563	0.7923
0.3	0.02	0.02	33.94	64.95	0.3221	0.3313	2.08	1.69	0.0715	1.0389	0.0011	0.0012	1.7652	1.7239
0.3	0.02	0.05	37.51	67.68	0.3180	0.3276	2.05	1.53	0.0689	0.8918	0.0039	0.0105	6.3879	4.4932
0.3	0.02	0.10	40.33	69.73	0.3128	0.3231	-0.22	-0.15	0.0054	0.7945	0.0143	0.0168	11.1302	7.2950
0.3	0.02	0.20	44.52	72.60	0.3086	0.3205	-3.57	-2.30	-0.0646	0.7484	0.0174	0.0202	15.2689	9.8355
0.3	0.02	0.50	50.51	76.40	0.3090	0.3234	-8.28	-4.79	-0.1335	0.7604	0.0170	0.0190	16.6607	10.9864
0.3	0.02	0.80	52.38	77.52	0.3112	0.3259	-9.73	-5.46	-0.1499	0.7782	0.0159	0.0177	16.0590	10.8483
0.3	0.05	0.05	37.31	67.54	0.3107	0.3189	1.85	1.41	0.0571	1.0052	0.0017	0.0018	1.6548	1.5296
0.3	0.05	0.10	41.54	70.58	0.3076	0.3167	0.99	0.69	0.0329	0.8819	0.0091	0.0104	6.8920	4.4992
0.3	0.05	0.20	45.73	73.39	0.3041	0.3148	-2.36	-1.51	-0.0414	0.8208	0.0129	0.0145	11.2330	7.1203
0.3	0.05	0.50	51.71	77.13	0.3050	0.3182	-7.08	-4.06	-0.1147	0.8292	0.0130	0.0138	12.9037	8.4882
0.3	0.05	0.80	53.58	78.24	0.3072	0.3207	-8.53	-4.75	-0.1321	0.8487	0.0119	0.0125	12.3774	8.4142
0.3	0.10	0.10	42.08	70.95	0.3004	0.3092	1.53	1.07	0.0410	0.9878	0.0019	0.0020	1.5014	1.2704
0.3	0.10	0.20	47.43	74.49	0.2990	0.3086	-0.66	-0.42	-0.0085	0.8996	0.0079	0.0083	6.5477	4.0358
0.3	0.10	0.50	53.41	78.14	0.3004	0.3125	-5.38	-3.06	-0.0879	0.9046	0.0084	0.0081	8.4964	5.5956
0.3	0.10	0.80	55.28	79.22	0.3027	0.3150	-6.83	-3.76	-0.1067	0.9261	0.0073	0.0068	8.0714	5.6354
0.3	0.20	0.20	49.13	75.56	0.2928	0.3018	1.04	0.65	0.0233	0.9823	0.0016	0.0015	1.1715	0.8374

Exhibit A-6 (continued)

0.3	0.20	0.50	55.91	79.58	0.2957	0.3071	-2.88	-1.61	-0.0477	0.9713	0.0037	0.0028	3.7683	2.5103
0.3	0.20	0.80	57.78	80.63	0.2930	0.3096	-4.33	-2.35	-0.0683	0.9851	0.0026	0.0015	3.5607	2.7756
0.3	0.50	0.50	59.13	81.38	0.2927	0.3049	0.34	0.19	0.0059	0.9909	0.0007	0.0005	0.4855	0.3218
0.3	0.50	0.80	61.26	82.53	0.2954	0.3077	-0.85	-0.45	-0.0139	1.0031	0.0000	-0.0005	0.5683	0.5289
0.3	0.80	0.50	62.22	83.05	0.2956	0.3083	0.11	0.06	0.0017	0.9953	0.0003	0.0002	0.1953	0.1231
0.0	0.02	0.02	13.69	43.83	0.2906	0.2967	8.85	17.51	1.8461	0.3702	0.0425	0.0451	18.4654	18.6307
0.0	0.02	0.05	23.98	56.10	0.2967	0.3055	12.58	15.82	1.1225	0.3601	0.0456	0.0492	22.6575	19.0907
0.0	0.02	0.10	29.16	60.95	0.2933	0.3042	8.45	8.29	0.4206	0.4413	0.0373	0.0407	21.7858	15.6802
0.0	0.02	0.20	36.88	67.21	0.2938	0.3074	2.34	1.79	0.0762	0.5473	0.0291	0.0318	21.4559	13.3837
0.0	0.02	0.50	48.00	74.85	0.3029	0.3193	-6.38	-3.85	-0.1111	0.6951	0.0202	0.0217	18.6144	11.7276
0.0	0.02	0.80	51.53	77.02	0.3087	0.3246	-9.10	-5.17	-0.1440	0.7511	0.0170	0.0185	16.7645	11.0719
0.0	0.05	0.05	19.27	51.04	0.2780	0.2841	7.87	10.76	0.6954	0.5245	0.0269	0.0279	12.7782	12.0711
0.0	0.05	0.10	30.37	62.00	0.2879	0.2971	9.66	9.34	0.4742	0.4915	0.0319	0.0336	18.1758	13.3939
0.0	0.05	0.20	33.09	68.11	0.2394	0.3015	3.54	2.69	0.1082	0.5999	0.0247	0.0259	17.5508	10.9080
0.0	0.05	0.50	49.21	75.60	0.2990	0.3140	-5.17	-3.10	-0.0909	0.7571	0.0162	0.0165	14.3532	9.2152
0.0	0.05	0.80	52.74	77.74	0.3048	0.3194	-7.89	-4.45	-0.1259	0.8137	0.0131	0.0133	13.0743	8.6267
0.0	0.10	0.10	27.19	59.19	0.2725	0.2801	6.49	6.52	0.3138	0.6676	0.0165	0.0166	8.9927	7.7755
0.0	0.10	0.20	39.79	69.34	0.2845	0.2953	5.24	3.92	0.1538	0.6551	0.0199	0.0197	13.3033	8.6956
0.0	0.10	0.50	50.91	76.64	0.2946	0.3083	-3.47	-2.06	-0.0621	0.8243	0.0118	0.0108	10.4533	6.3260
0.0	0.10	0.80	54.44	78.73	0.3003	0.3137	-6.19	-3.46	-0.1000	0.8925	0.0086	0.0076	8.7502	5.8142
0.0	0.20	0.20	38.96	68.75	0.2737	0.2841	4.42	3.33	0.1266	0.8026	0.0090	0.0085	5.6727	4.3797
0.0	0.20	0.50	53.40	78.13	0.2901	0.3031	-0.97	-0.57	-0.0189	0.8824	0.0073	0.0055	5.8441	3.3564
0.0	0.20	0.80	56.93	80.16	0.2957	0.3083	-3.69	-2.03	-0.0612	0.9577	0.0040	0.0023	4.1703	2.8569
0.0	0.50	0.50	55.81	79.52	0.2857	0.2998	1.43	0.82	0.0247	0.9323	0.0029	0.0022	2.0535	1.5690
0.0	0.50	0.80	60.41	82.08	0.2932	0.3064	-0.21	-0.11	-0.0052	0.9679	0.0015	0.0004	1.1611	0.6937
0.0	0.80	0.80	61.10	82.45	0.2928	0.3067	0.48	0.26	0.0069	0.9716	0.0012	0.0007	0.8126	0.5131

Exhibit A-6 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) =	1.0										
THETA LENGTH RP/RV0	RV	REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.														

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) =	2.0												
PLUME ALTITUDE (M) =	392.												
SIGMA Y (M) =	123.												
SIGMA Z (M) =	39.												
SO2-SO4 CONVERSION RATE=	0.0000 PERCENT/HR												
NOX-NO3 CONVERSION RATE=	0.0000 PERCENT/HR												
ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)	
H+2S													
INCREMENT!	1.868	0.125	0.000	6.711	0.000	0.382	0.000	0.000	-0.037	130.686	1.624	0.000	
TOTAL AMB!	1.868	0.125	0.000	6.711	0.000	0.382	2.936	0.195	0.001	143.622	1.752	4.767	
H+1S													
INCREMENT!	8.373	0.695	0.000	8.303	0.000	1.713	0.000	0.000	-0.037	585.694	7.277	0.000	
TOTAL AMB!	8.373	0.695	0.000	8.303	0.000	1.713	2.936	0.044	0.001	598.630	7.405	1.128	
H													
INCREMENT!	13.805	1.462	0.000	10.593	0.000	2.824	0.000	0.000	-0.037	965.645	11.997	0.000	
TOTAL AMB!	13.805	1.462	0.000	10.593	0.000	2.824	2.936	0.026	0.001	978.581	12.125	0.689	
H-1S													
INCREMENT!	8.373	0.695	0.000	8.303	0.000	1.713	0.000	0.000	-0.037	585.693	7.277	0.000	
TOTAL AMB!	8.373	0.695	0.000	8.303	0.000	1.713	2.936	0.044	0.001	598.629	7.405	1.128	
H-2S													
INCREMENT!	1.868	0.125	0.000	6.711	0.000	0.382	0.000	0.000	-0.037	130.686	1.624	0.000	
TOTAL AMB!	1.868	0.125	0.000	6.711	0.000	0.382	2.936	0.195	0.001	143.622	1.752	4.767	
0													
INCREMENT!	0.000	0.000	0.000	0.000	1.607	0.000	0.000	0.230	0.000	0.000	0.000	5.690	
TOTAL AMB!	0.000	0.000	0.000	98.393	1.607	0.000	2.936	100.000	0.038	12.936	0.128	65.142	

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

	SO2!	0.0000
	NOX!	0.0000
PRIMARY PARTICULATE!		0.0000
	SO4!	0.0000
	NO3!	0.0000

Exhibit A-6 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = [illegible]
PLUME ALTITUDE (M) = [illegible]
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	YCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	30.	0.02	148.4	19.80	85.65	94.17	0.3597	0.3686	-19.25	-7.70	-0.1819	0.5186	0.0408	0.0375	35.8798	24.119
	30.	0.05	147.2	20.43	88.00	95.17	0.3564	0.3583	-16.91	-6.70	-0.1615	0.6375	0.0315	0.0273	28.1184	18.909
	30.	0.10	145.6	21.30	91.29	96.53	0.3398	0.3471	-13.62	-5.33	-0.1323	0.7733	0.0210	0.0161	19.0071	12.267
	30.	0.20	143.3	22.56	96.68	98.47	0.3286	0.3362	-8.83	-3.40	-0.0835	0.9032	0.0093	0.0052	9.1566	5.930
	30.	0.50	140.1	24.27	102.63	101.01	0.3203	0.3303	-2.28	-0.86	-0.0256	0.9783	0.0014	-0.0007	1.8090	1.307
	30.	0.80	138.2	19.88	104.54	101.73	0.3197	0.3307	-0.37	-0.14	-0.0061	0.9746	0.0003	-0.0003	0.9051	0.593
	45.	0.02	159.8	13.61	89.34	95.73	0.3521	0.3630	-15.57	-6.14	-0.1455	0.5790	0.0332	0.0319	30.2998	20.220
	45.	0.05	158.9	14.09	91.24	96.51	0.3448	0.3547	-13.67	-5.35	-0.1292	0.6825	0.0260	0.0236	23.8797	15.664
	45.	0.10	157.7	14.77	93.91	97.60	0.3364	0.3454	-11.00	-4.27	-0.1053	0.8010	0.0173	0.0143	16.2406	10.459
	45.	0.20	155.9	15.75	97.78	99.14	0.3272	0.3360	-7.12	-2.73	-0.0709	0.9194	0.0083	0.0050	7.8359	5.031
	45.	0.50	153.4	17.10	103.07	101.17	0.3201	0.3306	-1.84	-0.69	-0.0204	0.9823	0.0012	-0.0006	1.5434	1.120
	45.	0.80	152.6	17.51	104.61	101.75	0.3195	0.3309	-0.30	-0.11	-0.0043	0.9799	0.0007	-0.0002	0.7263	0.473
	60.	0.02	164.7	10.96	91.38	96.57	0.3477	0.3594	-13.53	-5.30	-0.1257	0.6193	0.0283	0.0283	26.8510	17.847
	60.	0.05	164.0	11.37	93.04	97.25	0.3416	0.3522	-11.87	-4.62	-0.1116	0.7127	0.0227	0.0211	21.2225	13.890
	60.	0.10	162.9	11.94	95.36	98.18	0.3343	0.3440	-9.55	-3.69	-0.0914	0.8198	0.0155	0.0130	14.4892	9.319
	60.	0.20	161.4	12.78	98.73	99.51	0.3263	0.3357	-6.18	-2.36	-0.0612	0.9270	0.0074	0.0047	7.0040	4.481
	60.	0.50	159.2	13.94	103.31	101.27	0.3200	0.3307	-1.59	-0.60	-0.0177	0.9845	0.0011	-0.0003	1.3525	0.970
	60.	0.80	158.6	14.29	104.65	101.77	0.3194	0.3309	-0.26	-0.10	-0.0042	0.9827	0.0006	-0.0002	0.6294	0.409
	90.	0.02	167.6	9.41	92.74	97.13	0.3448	0.3568	-12.17	-4.74	-0.1127	0.6439	0.0259	0.0257	24.4367	16.190
	90.	0.05	166.9	9.77	94.23	97.73	0.3393	0.3504	-10.68	-4.14	-0.1000	0.7349	0.0205	0.0193	19.3602	12.643
	90.	0.10	166.0	10.28	96.32	98.56	0.3329	0.3430	-8.59	-3.31	-0.0820	0.8336	0.0140	0.0120	13.2462	8.511
	90.	0.20	164.6	11.02	99.35	99.75	0.3257	0.3354	-5.56	-2.12	-0.0549	0.9326	0.0068	0.0044	6.4133	4.094
	90.	0.50	162.7	12.06	103.43	101.33	0.3199	0.3303	-1.43	-0.54	-0.0153	0.9850	0.0010	-0.0003	1.2211	0.871
	90.	0.80	162.1	12.37	104.67	101.78	0.3194	0.3309	-0.24	-0.09	-0.0033	0.9845	0.0005	-0.0002	0.5652	0.366
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.03	167.4	9.50	93.11	97.27	0.3434	0.3551	-11.80	-4.59	-0.1096	0.6712	0.0245	0.0241	23.1309	15.268
90.																
	30.	0.02	151.7	18.01	45.37	73.16	0.3423	0.3533	-14.11	-8.41	-0.2371	0.5347	0.0406	0.0401	32.0861	21.715
	30.	0.05	150.1	18.88	47.04	74.24	0.3320	0.3412	-12.45	-7.34	-0.2110	0.6658	0.0302	0.0279	24.6177	16.629
	30.	0.10	147.9	20.06	49.38	75.71	0.3207	0.3284	-10.11	-5.87	-0.1737	0.8126	0.0189	0.0152	16.0760	10.603
	30.	0.20	144.8	21.73	52.80	77.77	0.3094	0.3167	-6.69	-3.89	-0.1178	0.9519	0.0076	0.0035	7.2513	5.154
	30.	0.50	140.7	23.96	57.50	80.48	0.3019	0.3115	-1.99	-1.10	-0.0371	1.0073	0.0001	-0.0010	1.6144	1.444
	30.	0.80	138.2	19.88	58.38	81.24	0.3017	0.3123	-0.60	-0.33	-0.0122	0.9934	-0.0001	-0.0009	0.6634	0.563
	45.	0.02	162.3	12.25	48.09	74.90	0.3346	0.3473	-11.40	-6.67	-0.1696	0.5929	0.0329	0.0341	27.1635	18.295
	45.	0.05	161.1	12.91	49.44	75.75	0.3267	0.3376	-10.05	-5.83	-0.1687	0.7052	0.0249	0.0244	21.0186	13.936
	45.	0.10	159.5	13.81	51.33	76.99	0.3178	0.3271	-8.15	-4.67	-0.1389	0.8318	0.0160	0.0133	13.6574	9.142
	45.	0.20	157.1	15.10	54.10	78.54	0.3085	0.3170	-5.39	-3.04	-0.0942	0.9534	0.0067	0.0033	6.2659	4.342
	45.	0.50	153.8	16.86	57.89	80.69	0.3020	0.3119	-1.60	-0.83	-0.0297	1.0051	0.0002	-0.0013	1.2732	1.137
	45.	0.80	152.8	17.38	59.00	81.31	0.3017	0.3125	-0.48	-0.26	-0.0098	0.9948	-0.0000	-0.0007	0.5253	0.446
	60.	0.02	166.8	9.82	49.59	75.84	0.3302	0.3434	-9.90	-5.74	-0.1639	0.6322	0.0284	0.0302	24.0873	16.091
	60.	0.05	165.8	10.37	50.76	76.56	0.3236	0.3351	-8.72	-5.02	-0.1458	0.7327	0.0218	0.0218	18.7241	12.372
	60.	0.10	164.4	11.13	52.41	77.55	0.3159	0.3259	-7.07	-4.03	-0.1200	0.8463	0.0141	0.0127	12.3116	8.153

Exhibit A-6 (continued)

60.	0.20	162.4	12.22	54.81	78.95	0.3078	0.3169	-4.67	-2.62	-0.0814	0.9560	0.0960	0.0037	5.6301	3.860
60.	0.50	159.6	13.73	58.10	80.81	0.3020	0.3122	-1.38	-0.76	-0.0237	1.0041	0.0002	-0.0010	1.0041	0.975
60.	0.80	158.8	14.18	59.07	81.35	0.3018	0.3126	-0.42	-0.23	-0.0084	0.9955	-0.0009	-0.0005	0.4515	0.384
90.	0.02	169.5	8.41	50.59	76.45	0.3272	0.3406	-8.99	-5.12	-0.1469	0.6610	0.0255	0.0274	21.9262	14.509
90.	0.05	168.6	8.89	51.64	77.09	0.3214	0.3332	-7.84	-4.49	-0.1307	0.7531	0.0196	0.0200	17.0954	11.270
90.	0.10	167.3	9.56	53.13	77.97	0.3146	0.3250	-6.36	-3.60	-0.1076	0.8573	0.0128	0.0117	11.9731	7.453
90.	0.20	165.5	10.53	55.29	79.22	0.3073	0.3163	-4.20	-2.35	-0.0730	0.9584	0.0055	0.0035	5.1725	3.524
90.	0.50	163.0	11.87	58.24	80.89	0.3020	0.3123	-1.24	-0.68	-0.0230	1.0035	0.0002	-0.0009	0.9779	0.869
90.	0.80	162.3	12.27	59.11	81.37	0.3018	0.3127	-0.38	-0.21	-0.0076	0.9960	-0.0000	-0.0005	0.4032	0.343
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE															
90.	0.03	169.2	8.52	50.65	76.61	0.3257	0.3386	-8.64	-4.97	-0.1429	0.6351	0.0239	0.0254	20.6776	13.729

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
30.		0.02	154.0	16.74	45.86	73.48	0.3391	0.3531	-18.14	-10.50	-0.2743	0.5329	0.0411	0.0421	34.6438	23.682
30.		0.05	152.1	17.77	47.96	74.82	0.3276	0.3393	-16.04	-9.16	-0.2444	0.6762	0.0296	0.0284	26.1560	17.736
30.		0.10	149.5	19.17	50.91	76.65	0.3155	0.3253	-13.08	-7.33	-0.2017	0.8345	0.0174	0.0144	16.6615	11.473
30.		0.20	145.9	21.14	55.24	79.20	0.3039	0.3131	-8.76	-4.78	-0.1377	0.9302	0.0058	0.0022	7.2460	5.652
30.		0.50	141.1	23.74	61.22	82.51	0.2970	0.3003	-2.78	-1.47	-0.0454	1.0273	-0.0011	-0.0026	2.0575	1.800
30.		0.80	140.2	19.88	63.00	83.46	0.2973	0.3096	-1.80	-0.52	-0.0163	1.0066	-0.0008	-0.0014	0.9796	0.782
45.		0.02	164.1	11.30	49.36	75.70	0.3312	0.3466	-14.63	-8.28	-0.2194	0.5913	0.0332	0.0357	29.3157	19.823
45.		0.05	162.7	12.07	51.06	76.74	0.3225	0.3358	-12.93	-7.24	-0.1955	0.7127	0.0245	0.0248	22.3343	15.039
45.		0.10	160.7	13.13	53.45	78.16	0.3130	0.3243	-10.54	-5.82	-0.1613	0.8480	0.0149	0.0134	14.4377	9.709
45.		0.20	157.9	14.65	56.93	80.17	0.3034	0.3137	-7.05	-3.81	-0.1101	0.9748	0.0054	0.0023	6.2760	4.711
45.		0.50	154.1	16.68	61.76	82.80	0.2974	0.3090	-2.23	-1.17	-0.0363	1.0207	-0.0007	-0.0019	1.5040	1.430
45.		0.80	153.0	17.29	63.19	83.56	0.2975	0.3099	-0.80	-0.42	-0.0135	1.0051	-0.0006	-0.0011	0.7663	0.622
60.		0.02	168.3	9.02	51.30	76.88	0.3267	0.3424	-12.70	-7.10	-0.1896	0.6311	0.0286	0.0315	25.9782	17.461
60.		0.05	167.1	9.66	52.77	77.76	0.3194	0.3332	-11.22	-6.22	-0.1689	0.7390	0.0214	0.0223	19.9536	13.331
60.		0.10	165.5	10.56	54.85	78.97	0.3113	0.3233	-9.14	-5.00	-0.1394	0.8598	0.0133	0.0123	12.9605	8.729
60.		0.20	163.1	11.84	57.89	80.69	0.3030	0.3133	-6.11	-3.29	-0.0952	0.9740	0.0049	0.0029	5.6509	4.169
60.		0.50	159.9	13.58	62.06	82.96	0.2975	0.3093	-1.93	-1.01	-0.0314	1.0174	-0.0005	-0.0016	1.3434	1.223
60.		0.80	158.9	14.10	63.30	83.62	0.2976	0.3100	-0.69	-0.36	-0.0116	1.0044	-0.0003	-0.0009	0.6521	0.534
90.		0.02	170.7	7.70	52.58	77.65	0.3236	0.3394	-11.42	-6.33	-0.1699	0.6602	0.0256	0.0235	23.6346	15.922
90.		0.05	169.7	8.27	53.91	78.43	0.3173	0.3313	-10.09	-5.55	-0.1514	0.7587	0.0193	0.0204	18.2228	12.186
90.		0.10	168.2	9.05	55.78	79.51	0.3101	0.3224	-8.22	-4.47	-0.1250	0.8692	0.0121	0.0115	11.8912	7.977
90.		0.20	166.2	10.19	58.51	81.04	0.3026	0.3138	-5.49	-2.94	-0.0853	0.9743	0.0046	0.0029	5.1995	3.796
90.		0.50	163.3	11.74	62.26	83.07	0.2976	0.3095	-1.73	-0.91	-0.0281	1.0153	-0.0004	-0.0014	1.1901	1.093
90.		0.80	162.4	12.20	63.37	83.65	0.2976	0.3101	-0.62	-0.32	-0.0104	1.0039	-0.0004	-0.0008	0.5796	0.476
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
90.		0.03	170.5	7.84	52.91	77.84	0.3220	0.3373	-11.09	-6.14	-0.1654	0.6360	0.0239	0.0263	22.2307	14.853

Exhibit A-6 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (XD) = 2.0
PLUME ALTITUDE (H) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.															
	30.	15.	2.93	61.46	82.64	0.3397	0.3518	19.86	12.02	0.4791	0.1932	0.0789	0.0808	60.6703	39.2735
	30.	30.	1.41	54.44	78.74	0.3443	0.3547	30.24	22.41	1.2544	0.1413	0.0918	0.0959	62.4019	46.1922
	30.	45.	0.83	51.87	77.22	0.3472	0.3566	34.09	27.96	1.9251	0.1226	0.0972	0.1020	62.2953	46.6707
	30.	60.	0.60	50.65	76.49	0.3488	0.3578	35.89	31.14	2.4397	0.1139	0.1000	0.1031	62.2103	46.8923
	30.	75.	0.44	50.07	76.13	0.3497	0.3586	36.73	32.82	2.7626	0.1097	0.1014	0.1057	62.2119	46.9281
	30.	90.	0.39	49.89	76.02	0.3500	0.3588	36.97	33.35	2.8725	0.1083	0.1019	0.1072	62.2252	46.9356
	45.	15.	2.10	57.06	80.23	0.3278	0.3418	15.46	9.61	0.3764	0.2446	0.0671	0.0709	51.9364	33.8933
	45.	30.	1.04	48.19	74.97	0.3324	0.3459	23.99	18.64	0.9980	0.1773	0.0797	0.0850	53.2335	37.6782
	45.	45.	0.68	44.94	72.87	0.3355	0.3459	27.16	23.61	1.3360	0.1533	0.0855	0.0912	53.1341	39.7011
	45.	60.	0.51	43.41	71.86	0.3374	0.3472	28.65	26.51	1.9493	0.1428	0.0885	0.0945	53.0698	41.0029
	45.	75.	0.42	42.69	71.37	0.3384	0.3480	29.33	28.06	2.2091	0.1386	0.0901	0.0961	53.0376	41.6563
	45.	90.	0.39	42.48	71.22	0.3387	0.3482	29.56	28.55	2.2977	0.1370	0.0906	0.0966	53.0261	42.1084
	60.	15.	1.73	54.79	78.94	0.3204	0.3350	13.19	8.32	0.3227	0.2512	0.0596	0.0640	46.5012	29.7251
	60.	30.	0.83	44.85	72.82	0.3248	0.3366	20.65	16.50	0.8605	0.2056	0.0721	0.0778	47.7039	33.4668
	60.	45.	0.60	41.21	70.55	0.3283	0.3389	23.43	21.09	1.3259	0.1771	0.0782	0.0842	47.7125	35.3967
	60.	60.	0.47	39.50	69.14	0.3304	0.3404	24.74	23.79	1.6837	0.1634	0.0815	0.0876	47.6972	36.2965
	60.	75.	0.41	38.70	68.36	0.3315	0.3412	25.36	25.23	1.9088	0.1568	0.0832	0.0893	47.7029	36.6830
	60.	90.	0.39	38.46	68.38	0.3318	0.3415	25.54	25.71	1.9856	0.1549	0.0837	0.0898	47.7129	37.9231
	90.	15.	1.51	53.33	78.09	0.3151	0.3300	11.73	7.47	0.2873	0.3111	0.0544	0.0590	42.5965	27.1382
	90.	30.	0.78	42.67	71.36	0.3194	0.3313	18.47	15.03	0.7703	0.2239	0.0667	0.0724	43.3137	30.6683
	90.	45.	0.55	38.76	68.60	0.3230	0.3337	20.99	19.34	1.1879	0.1967	0.0730	0.0790	43.9297	32.7641
	90.	60.	0.45	36.93	67.25	0.3253	0.3353	22.17	21.91	1.5039	0.1810	0.0764	0.0825	43.9312	34.0368
	90.	75.	0.41	36.07	66.60	0.3265	0.3362	22.73	23.29	1.7109	0.1734	0.0782	0.0843	44.0241	34.7917
	90.	90.	0.39	35.81	66.40	0.3269	0.3365	22.89	23.73	1.7798	0.1712	0.0788	0.0849	44.0610	35.0263
90.															
	30.	15.	2.93	32.68	63.93	0.3214	0.3345	6.34	5.84	0.2415	0.2288	0.0716	0.0779	47.5295	30.7814
	30.	30.	1.41	28.22	60.12	0.3261	0.3373	12.84	13.93	0.8348	0.1641	0.0839	0.0927	46.7355	33.3368
	30.	45.	0.83	26.59	58.62	0.3290	0.3393	15.27	18.47	1.3487	0.1423	0.0893	0.0959	45.9527	34.6795
	30.	60.	0.60	25.81	57.89	0.3308	0.3406	16.40	21.10	1.7427	0.1320	0.0922	0.1021	44.9033	35.5804
	30.	75.	0.44	25.43	57.53	0.3318	0.3414	16.93	22.48	1.9697	0.1270	0.0937	0.1033	44.6346	36.1127
	30.	90.	0.39	25.32	57.42	0.3321	0.3417	17.09	22.92	2.0737	0.1254	0.0942	0.1043	44.5657	36.3021
	45.	15.	2.10	31.11	62.63	0.3097	0.3243	4.78	4.25	0.1853	0.2799	0.0599	0.0676	40.5313	26.3571
	45.	30.	1.04	25.52	57.61	0.3137	0.3256	10.13	11.41	0.6616	0.2033	0.0715	0.0810	39.7302	28.2517
	45.	45.	0.68	23.46	55.58	0.3168	0.3275	12.14	15.43	1.0743	0.1734	0.0771	0.0871	38.5682	29.3858
	45.	60.	0.51	22.49	54.58	0.3188	0.3289	13.09	17.79	1.3915	0.1583	0.0802	0.0904	37.9309	30.1731
	45.	75.	0.42	22.03	54.10	0.3198	0.3297	13.53	19.03	1.5908	0.1509	0.0817	0.0920	37.6376	30.6394
	45.	90.	0.39	21.89	53.95	0.3201	0.3299	13.66	19.43	1.6587	0.1571	0.0822	0.0925	37.5543	30.7945
	60.	15.	1.73	30.34	61.98	0.3025	0.3173	4.01	3.60	0.1572	0.3200	0.0527	0.0606	36.4393	23.4981
	60.	30.	0.88	24.09	56.21	0.3061	0.3178	8.79	10.01	0.5693	0.2384	0.0639	0.0733	35.4351	25.1693
	60.	45.	0.60	21.78	53.83	0.3094	0.3199	10.47	13.68	0.9263	0.2063	0.0697	0.0793	34.4039	26.2467
	60.	60.	0.47	20.70	52.66	0.3115	0.3214	11.30	15.86	1.2016	0.1907	0.0729	0.0828	33.8494	27.0027
	60.	75.	0.41	20.19	52.09	0.3126	0.3222	11.69	17.04	1.3744	0.1831	0.0745	0.0846	33.5913	27.4317
	60.	90.	0.39	20.04	51.92	0.3130	0.3225	11.81	17.42	1.4334	0.1808	0.0750	0.0851	33.5173	27.6004
	90.	15.	1.51	29.86	61.57	0.2974	0.3121	3.53	3.18	0.1393	0.3524	0.0476	0.0554	33.3792	21.4593
	90.	30.	0.78	23.16	55.27	0.3007	0.3122	7.77	9.07	0.5093	0.2651	0.0585	0.0676	32.4166	23.0130
	90.	45.	0.57	20.69	52.64	0.3040	0.3143	9.37	12.49	0.8300	0.2292	0.0643	0.0739	31.5101	24.0692
	90.	60.	0.45	19.53	51.33	0.3063	0.3159	10.12	14.54	1.0767	0.2114	0.0677	0.0773	31.0259	24.8067
	90.	75.	0.41	18.98	50.70	0.3075	0.3168	10.48	15.68	1.2319	0.2027	0.0694	0.0791	30.8036	25.2481
	90.	90.	0.39	18.81	50.51	0.3079	0.3171	10.58	16.01	1.2849	0.2001	0.0699	0.0797	30.7404	25.3963

Exhibit A-6 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 3.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.															
	30.	15.	2.93	32.93	64.15	0.3169	0.3333	2.46	2.03	0.1029	0.2363	0.0692	0.0781	50.1413	31.8702
	30.	30.	1.41	27.77	59.71	0.3219	0.3364	9.91	10.35	0.5915	0.1639	0.0318	0.0935	43.7492	33.5762
	30.	45.	0.88	25.85	57.93	0.3252	0.3388	12.71	14.91	1.0151	0.1446	0.0373	0.1001	47.0323	34.4302
	30.	60.	0.60	24.94	57.05	0.3272	0.3404	14.01	17.53	1.3397	0.1334	0.0907	0.1036	46.0577	35.0655
	30.	75.	0.44	24.50	56.62	0.3284	0.3414	14.62	18.96	1.5429	0.1279	0.0923	0.1035	45.6069	35.4759
	30.	90.	0.39	24.37	56.49	0.3288	0.3418	14.80	19.39	1.6120	0.1261	0.0929	0.1061	45.4333	35.6208
	45.	15.	2.10	32.09	63.44	0.3049	0.3226	1.60	1.34	0.0740	0.2903	0.0372	0.0674	43.1547	27.3623
	45.	30.	1.04	25.61	57.70	0.3089	0.3238	7.73	8.33	0.4666	0.2136	0.0587	0.0803	41.4566	29.4498
	45.	45.	0.68	23.21	55.33	0.3122	0.3260	10.07	12.30	0.8072	0.1643	0.0745	0.0872	39.8197	29.1142
	45.	60.	0.51	22.09	54.15	0.3144	0.3275	11.16	14.65	1.0639	0.1700	0.0778	0.0907	39.0737	29.6367
	45.	75.	0.42	21.53	53.58	0.3156	0.3283	11.67	15.92	1.2333	0.1631	0.0795	0.0923	38.6050	29.9694
	45.	90.	0.39	21.39	53.41	0.3159	0.3288	11.83	16.32	1.2894	0.1610	0.0800	0.0931	38.3649	30.0832
	60.	15.	1.73	31.72	63.14	0.2976	0.3151	1.23	1.03	0.0607	0.3336	0.0499	0.0599	38.5333	24.3313
	60.	30.	0.88	24.49	56.61	0.3009	0.3154	6.63	7.24	0.4003	0.2403	0.0607	0.0725	36.2222	25.2924
	60.	45.	0.60	21.81	53.86	0.3043	0.3176	8.66	10.84	0.6959	0.2151	0.0666	0.0789	35.4619	25.9256
	60.	60.	0.47	20.55	52.49	0.3066	0.3193	9.62	12.99	0.9223	0.1931	0.0700	0.0823	34.6169	26.4301
	60.	75.	0.41	19.96	51.83	0.3078	0.3202	10.08	14.16	1.0656	0.1823	0.0718	0.0843	34.1937	26.7405
	60.	90.	0.39	19.78	51.63	0.3082	0.3205	10.22	14.53	1.1162	0.1783	0.0723	0.0849	34.0660	26.8531
	90.	15.	1.51	31.51	62.96	0.2926	0.3098	1.02	0.86	0.0527	0.3639	0.0443	0.0546	33.2133	22.2457
	90.	30.	0.78	23.76	55.88	0.2953	0.3094	5.90	6.52	0.3589	0.2735	0.0552	0.0665	33.7203	23.0769
	90.	45.	0.53	20.89	52.87	0.2987	0.3115	7.73	9.85	0.6229	0.2404	0.0610	0.0728	32.4133	23.7042
	90.	60.	0.43	19.53	51.36	0.3011	0.3133	8.62	11.86	0.8263	0.2211	0.0643	0.0764	31.6597	24.2065
	90.	75.	0.41	18.91	50.62	0.3024	0.3143	9.03	12.93	0.9359	0.2117	0.0663	0.0783	31.2027	24.5235
	90.	90.	0.39	18.72	50.40	0.3028	0.3146	9.15	13.30	0.9728	0.2083	0.0669	0.0789	31.1690	24.6311

Exhibit A-6 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
THETA = 45.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	92.73	97.12	0.3438	0.3540	-5.28	-2.11	-0.0515	0.8412	0.0119	0.0118	10.7966	7.2044
1.0	0.02	0.05	89.26	95.69	0.3513	0.3606	-9.67	-3.89	-0.0943	0.7211	0.0218	0.0211	19.3312	13.1213
1.0	0.02	0.10	90.00	96.09	0.3497	0.3590	-10.20	-4.08	-0.0979	0.6954	0.0230	0.0228	20.8745	14.0923
1.0	0.02	0.20	91.09	96.45	0.3477	0.3574	-10.97	-4.34	-0.1033	0.6739	0.0243	0.0243	22.6410	15.1060
1.0	0.02	0.50	92.61	97.07	0.3461	0.3567	-12.02	-4.69	-0.1106	0.6613	0.0253	0.0256	23.9901	16.0023
1.0	0.02	0.80	93.07	97.26	0.3461	0.3568	-12.32	-4.79	-0.1129	0.6611	0.0254	0.0255	24.0634	16.0553
1.0	0.02	0.80	94.27	97.74	0.3387	0.3482	-4.65	-1.84	-0.0454	0.8916	0.0092	0.0087	8.4549	5.6068
1.0	0.05	0.05	91.49	96.61	0.3489	0.3523	-8.71	-3.46	-0.0846	0.7944	0.0172	0.0160	15.6315	10.5075
1.0	0.05	0.10	91.49	96.61	0.3489	0.3523	-8.71	-3.46	-0.0846	0.7944	0.0172	0.0160	15.6315	10.5075
1.0	0.05	0.20	92.58	97.06	0.3421	0.3509	-9.48	-3.73	-0.0902	0.7647	0.0187	0.0179	17.4385	11.5428
1.0	0.05	0.50	94.10	97.67	0.3407	0.3502	-10.53	-4.09	-0.0979	0.7491	0.0199	0.0192	18.6049	12.4018
1.0	0.05	0.80	94.56	97.86	0.3406	0.3504	-10.83	-4.19	-0.1002	0.7433	0.0199	0.0192	18.6894	12.4924
1.0	0.10	0.10	96.43	98.61	0.3328	0.3415	-3.76	-1.47	-0.0369	0.9412	0.0061	0.0053	5.6753	3.6970
1.0	0.10	0.20	94.66	97.90	0.3354	0.3434	-7.40	-2.89	-0.0715	0.8700	0.0120	0.0104	11.2174	7.3038
1.0	0.10	0.50	96.18	98.51	0.3341	0.3429	-8.45	-3.25	-0.0797	0.8500	0.0133	0.0118	12.7256	8.2654
1.0	0.10	0.80	96.64	98.69	0.3341	0.3431	-8.73	-3.36	-0.0822	0.8434	0.0134	0.0118	12.8451	8.3503
1.0	0.20	0.20	99.58	99.84	0.3261	0.3348	-2.48	-0.95	-0.0243	0.9836	0.0028	0.0018	2.6206	1.7127
1.0	0.20	0.50	99.22	99.70	0.3263	0.3353	-5.41	-2.07	-0.0524	0.9513	0.0060	0.0042	5.8190	3.7983
1.0	0.20	0.80	99.67	99.87	0.3269	0.3355	-5.72	-2.17	-0.0551	0.9506	0.0062	0.0042	5.8712	3.8035
1.0	0.20	0.80	99.67	99.87	0.3269	0.3355	-5.72	-2.17	-0.0551	0.9506	0.0062	0.0042	5.8712	3.8035
1.0	0.50	0.50	103.90	101.49	0.3210	0.3309	-0.73	-0.27	-0.0074	1.0033	0.0002	-0.0002	0.3825	0.3505
1.0	0.50	0.80	103.80	101.45	0.3211	0.3309	-1.59	-0.60	-0.0161	1.0033	0.0004	-0.0004	0.8256	0.7132
1.0	0.80	0.80	103.17	101.26	0.3206	0.3311	-0.22	-0.08	-0.0023	1.0023	-0.0001	-0.0002	0.1410	0.1170
0.3	0.02	0.02	43.56	71.26	0.3316	0.3406	8.59	6.21	0.2456	0.0231	0.0121	0.0111	9.5922	7.8716
0.3	0.02	0.05	55.01	79.06	0.3361	0.3454	12.22	7.63	0.2874	0.6154	0.0273	0.0267	20.4183	14.5375
0.3	0.02	0.10	61.68	82.76	0.3330	0.3440	7.79	4.34	0.1476	0.5677	0.0311	0.0315	24.4511	16.0365
0.3	0.02	0.20	71.67	87.82	0.3323	0.3453	1.23	0.59	0.0211	0.5646	0.0318	0.0323	27.3391	17.3139
0.3	0.02	0.50	86.21	94.41	0.3383	0.3521	-8.12	-3.36	-0.0827	0.6121	0.0287	0.0287	26.6031	17.1403
0.3	0.02	0.80	90.90	96.37	0.3426	0.3554	-11.03	-4.37	-0.1049	0.6337	0.0268	0.0267	23.1966	16.5139
0.3	0.02	0.80	90.90	96.37	0.3426	0.3554	-11.03	-4.37	-0.1049	0.6337	0.0268	0.0267	23.1966	16.5139
0.3	0.05	0.05	50.46	76.37	0.3199	0.3288	7.67	4.94	0.1783	0.8235	0.0112	0.0101	8.5785	6.6569
0.3	0.05	0.10	63.17	83.55	0.3238	0.3333	9.20	3.13	0.1724	0.6591	0.0239	0.0229	13.6797	12.4965
0.3	0.05	0.20	73.16	88.54	0.3261	0.3378	2.71	1.30	0.0399	0.6443	0.0255	0.0250	21.8162	13.5834
0.3	0.05	0.50	87.70	95.04	0.3327	0.3453	-6.64	-2.73	-0.0687	0.6933	0.0231	0.0221	21.4692	13.5363
0.3	0.05	0.80	92.39	96.98	0.3372	0.3489	-9.54	-3.76	-0.0919	0.7232	0.0213	0.0202	20.0895	12.9324
0.3	0.10	0.10	60.25	81.99	0.3109	0.3204	6.35	3.57	0.1162	0.8537	0.0090	0.0078	7.0291	5.1405
0.3	0.10	0.20	75.25	89.52	0.3168	0.3294	4.79	2.29	0.0668	0.7365	0.0183	0.0166	15.2765	9.4695
0.3	0.10	0.50	89.79	95.91	0.3262	0.3379	-4.55	-1.86	-0.0487	0.7863	0.0166	0.0145	15.2429	9.3330
0.3	0.10	0.80	94.47	97.82	0.3307	0.3415	-7.46	-2.92	-0.0733	0.8203	0.0149	0.0128	13.9373	8.7966
0.3	0.20	0.20	74.83	89.32	0.3064	0.3175	4.37	2.09	0.0599	0.8970	0.0059	0.0047	4.7343	3.2378
0.3	0.20	0.50	92.82	97.16	0.3190	0.3302	-1.32	-0.61	-0.0186	0.8796	0.0094	0.0068	8.2614	4.8277
0.3	0.20	0.80	97.50	99.03	0.3235	0.3339	-4.43	-1.71	-0.0433	0.9176	0.0077	0.0052	7.0407	4.3141
0.3	0.50	0.50	95.79	98.35	0.3116	0.3246	1.45	0.58	0.0138	0.9593	0.0020	0.0012	1.7355	1.1033
0.3	0.50	0.80	101.63	100.62	0.3178	0.3293	-0.30	-0.12	-0.0033	0.9693	0.0019	0.0003	1.6814	0.9659
0.3	0.80	0.80	102.43	100.93	0.3167	0.3291	0.50	0.19	0.0040	0.9822	0.0008	0.0004	0.6845	0.4194
0.0	0.02	0.02	22.48	54.57	0.3121	0.3192	14.54	20.66	1.8022	0.3660	0.0455	0.0438	23.9843	22.7455
0.0	0.02	0.05	40.33	69.73	0.3227	0.3322	21.60	19.33	1.1462	0.3301	0.0527	0.0522	32.4543	26.0415
0.0	0.02	0.10	49.54	75.81	0.3210	0.3332	15.49	10.78	0.4548	0.3932	0.0457	0.0461	31.8737	21.9831

Exhibit A-6 (continued)

0.0	0.02	0.20	63.35	83.64	0.3233	0.3381	6.44	3.49	0.1156	0.4737	0.0383	0.0393	31.5347	19.0160
0.0	0.02	0.50	83.47	93.23	0.3346	0.3500	-6.46	-2.74	-0.0690	0.5354	0.0304	0.0303	23.9409	17.7477
0.0	0.02	0.80	89.97	95.99	0.3411	0.3547	-10.48	-4.19	-0.1014	0.6259	0.0274	0.0271	23.7063	16.7236
0.0	0.05	0.05	31.68	63.11	0.2988	0.3071	12.95	12.70	0.6318	0.5247	0.0288	0.0271	16.9365	14.7990
0.0	0.05	0.10	51.03	76.72	0.3131	0.3236	16.98	11.69	0.4937	0.4609	0.0378	0.0366	26.1917	18.6033
0.0	0.05	0.20	64.84	84.42	0.3168	0.3302	7.93	4.27	0.1388	0.5421	0.0321	0.0313	25.8913	16.2060
0.0	0.05	0.50	84.96	93.37	0.3291	0.3433	-4.97	-2.10	-0.0543	0.6631	0.0249	0.0236	22.8160	14.1695
0.0	0.05	0.80	91.45	96.60	0.3357	0.3482	-8.99	-3.57	-0.0882	0.7111	0.0220	0.0207	20.5921	13.1642
0.0	0.05	0.80	91.45	96.60	0.3357	0.3482	-8.99	-3.57	-0.0882	0.7111	0.0220	0.0207	20.5921	13.1642
0.0	0.10	0.10	44.74	72.74	0.2930	0.3031	10.69	7.71	0.3077	0.6702	0.0177	0.0160	11.8689	9.5572
0.0	0.10	0.20	66.93	85.48	0.3094	0.3215	10.01	5.33	0.1719	0.6200	0.0247	0.0226	19.4196	12.4232
0.0	0.10	0.50	87.04	94.76	0.3225	0.3356	-2.88	-1.21	-0.0334	0.7520	0.0183	0.0160	16.5564	9.9725
0.0	0.10	0.80	93.54	97.45	0.3292	0.3408	-6.91	-2.72	-0.0694	0.8064	0.0155	0.0132	14.4373	9.0091
0.0	0.10	0.80	93.54	97.45	0.3292	0.3408	-6.91	-2.72	-0.0694	0.8064	0.0155	0.0132	14.4373	9.0091
0.0	0.20	0.20	64.22	84.09	0.2943	0.3069	7.31	3.95	0.1241	0.6958	0.0096	0.0030	7.3492	5.3950
0.0	0.20	0.50	90.07	96.03	0.3153	0.3279	0.15	0.06	-0.0020	0.8407	0.0111	0.0032	9.6173	5.5721
0.0	0.20	0.80	96.57	98.66	0.3220	0.3332	-3.87	-1.51	-0.0412	0.9019	0.0083	0.0056	7.5489	4.5354
0.0	0.50	0.50	92.31	96.95	0.3073	0.3217	2.39	0.98	0.0243	0.9344	0.0031	0.0020	2.5957	1.6946
0.0	0.50	0.80	100.70	100.27	0.3164	0.3283	0.25	0.10	-0.0003	0.9523	0.0026	0.0010	2.3652	1.2300
0.0	0.80	0.80	101.25	100.48	0.3149	0.3282	0.01	0.31	0.0067	0.9724	0.0012	0.0006	1.0204	0.6339

Exhibit A-6 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 2.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	81.95	92.56	0.3447	0.3549	-12.64	-5.31	-0.1316	0.8665	0.0112	0.0113	10.3608	8.2304
1.0	0.02	0.05	69.90	86.96	0.3526	0.3612	-20.93	-9.38	-0.2281	0.7843	0.0196	0.0191	17.9773	14.0153
1.0	0.02	0.10	66.63	85.33	0.3511	0.3589	-18.83	-8.76	-0.2180	0.7733	0.0196	0.0195	17.7225	13.6456
1.0	0.02	0.20	61.68	82.76	0.3476	0.3545	-15.70	-7.75	-0.2000	0.7555	0.0199	0.0207	17.3117	13.3339
1.0	0.02	0.50	54.35	78.68	0.3379	0.3457	-11.13	-6.96	-0.1661	0.7131	0.0222	0.0243	19.5329	13.7459
1.0	0.02	0.80	51.92	77.25	0.3323	0.3422	-9.66	-5.45	-0.1529	0.6954	0.0239	0.0262	20.8533	14.2209
1.0	0.05	0.05	79.62	91.52	0.3414	0.3501	-11.21	-4.82	-0.1220	0.9261	0.0084	0.0030	8.4020	6.0538
1.0	0.05	0.10	67.68	85.86	0.3456	0.3523	-17.78	-8.23	-0.2066	0.8340	0.0141	0.0129	13.6777	10.9376
1.0	0.05	0.20	62.74	83.32	0.3419	0.3477	-14.64	-7.19	-0.1874	0.8527	0.0142	0.0139	13.4777	10.4028
1.0	0.05	0.50	55.41	79.29	0.3319	0.3385	-10.08	-5.45	-0.1512	0.8190	0.0163	0.0171	14.8327	10.4897
1.0	0.05	0.80	52.97	77.88	0.3264	0.3349	-8.61	-4.83	-0.1371	0.7928	0.0180	0.0189	16.0411	10.8972
1.0	0.10	0.10	76.28	90.00	0.3364	0.3434	-9.18	-4.09	-0.1068	0.9911	0.0048	0.0040	5.6352	4.7660
1.0	0.10	0.20	64.22	84.10	0.3351	0.3399	-13.16	-6.41	-0.1694	0.9852	0.0074	0.0061	8.6365	7.3924
1.0	0.10	0.50	56.89	80.13	0.3249	0.3304	-8.60	-4.61	-0.1299	0.9339	0.0093	0.0090	9.2995	6.8531
1.0	0.10	0.80	54.46	78.75	0.3195	0.3267	-7.12	-3.96	-0.1146	0.9034	0.0111	0.0107	10.3312	7.1092
1.0	0.20	0.20	71.19	87.59	0.3282	0.3335	-6.19	-2.92	-0.0809	1.0486	0.0005	-0.0004	2.9733	2.9393
1.0	0.20	0.50	59.05	81.33	0.3174	0.3223	-6.44	-3.41	-0.0981	1.0469	0.0018	0.0009	3.3623	3.5543
1.0	0.20	0.80	56.62	79.98	0.3120	0.3186	-4.96	-2.72	-0.0808	1.0116	0.0036	0.0026	4.2323	3.8051
1.0	0.50	0.50	63.53	83.74	0.3136	0.3193	-1.95	-1.01	-0.0292	1.0531	-0.0020	-0.0019	1.8661	1.3760
1.0	0.50	0.80	59.57	81.62	0.3065	0.3141	-2.01	-1.08	-0.0321	1.0624	-0.0019	-0.0019	1.7253	1.3727
1.0	0.80	0.80	60.94	82.36	0.3072	0.3152	-0.64	-0.34	-0.0096	1.0300	-0.0012	-0.0009	0.8959	0.5938
0.3	0.02	0.02	32.77	64.01	0.3299	0.3384	1.24	1.02	0.0380	0.9447	0.0071	0.0065	4.2330	2.9366
0.3	0.02	0.05	35.65	66.28	0.3305	0.3388	0.96	0.75	0.0273	0.7734	0.0183	0.0187	11.7943	7.9171
0.3	0.02	0.10	38.31	68.27	0.3259	0.3353	-0.85	-0.62	-0.0199	0.6391	0.0233	0.0252	16.6227	10.9633
0.3	0.02	0.20	42.27	71.08	0.3223	0.3335	-3.51	-2.34	-0.0734	0.6449	0.0265	0.0293	20.9670	13.6569
0.3	0.02	0.50	47.93	74.82	0.3234	0.3368	-7.24	-4.35	-0.1278	0.6465	0.0268	0.0292	22.7852	14.9210
0.3	0.02	0.80	49.75	75.93	0.3258	0.3392	-8.37	-4.89	-0.1410	0.6531	0.0260	0.0281	22.3136	14.7634
0.3	0.05	0.05	35.80	66.40	0.3180	0.3253	1.12	0.86	0.0308	0.9529	0.0038	0.0031	3.5591	2.3725
0.3	0.05	0.10	39.37	69.04	0.3185	0.3261	0.21	0.15	0.0049	0.8945	0.0158	0.0160	11.0460	7.0837
0.3	0.05	0.20	43.32	71.89	0.3158	0.3253	-2.45	-1.63	-0.0522	0.7408	0.0199	0.0211	15.7050	10.0132
0.3	0.05	0.50	49.01	75.43	0.3175	0.3293	-6.18	-3.69	-0.1103	0.7367	0.0208	0.0217	17.3560	11.5234
0.3	0.05	0.80	50.80	76.58	0.3200	0.3318	-7.32	-4.24	-0.1244	0.7497	0.0201	0.0207	17.4534	11.4141
0.3	0.10	0.10	40.09	69.56	0.3069	0.3137	0.93	0.67	0.0224	0.9619	0.0043	0.0035	2.7239	1.7535
0.3	0.10	0.20	44.00	72.79	0.3083	0.3162	-0.97	-0.64	-0.0220	0.8490	0.0125	0.0120	9.5149	5.8651
0.3	0.10	0.50	50.49	76.39	0.3107	0.3209	-4.79	-2.78	-0.0854	0.8337	0.0140	0.0133	12.0094	7.6087
0.3	0.10	0.80	52.28	77.47	0.3132	0.3235	-5.83	-3.35	-0.1007	0.8534	0.0133	0.0124	11.6902	7.5668
0.3	0.20	0.20	46.43	73.85	0.2984	0.3061	0.66	0.43	0.0129	0.9733	0.0026	0.0019	1.7133	1.0652
0.3	0.20	0.50	52.65	77.69	0.3034	0.3127	-2.54	-1.48	-0.0480	0.9372	0.0067	0.0051	5.6023	3.4592
0.3	0.20	0.80	54.44	78.74	0.3059	0.3153	-3.67	-2.08	-0.0653	0.9539	0.0060	0.0042	5.4015	3.5368
0.3	0.50	0.50	55.42	79.30	0.2975	0.3060	0.23	0.13	0.0033	0.9889	0.0008	0.0004	0.5496	0.3352
0.3	0.50	0.80	57.40	80.42	0.3006	0.3109	-0.72	-0.40	-0.0141	0.9983	0.0008	-0.0002	0.3936	0.6029
0.3	0.80	0.80	53.20	80.87	0.3002	0.3112	0.08	0.05	0.0010	0.9950	0.0003	0.0001	0.2057	0.1257

Exhibit A-6 (continued)

0.0	0.02	0.02	11.70	40.78	0.2928	0.2971	7.19	15.43	1.5660	0.3893	0.0412	0.0425	16.5031	16.6203
0.0	0.02	0.05	20.97	52.96	0.3034	0.3113	10.34	13.97	0.9624	0.3509	0.0407	0.0520	22.5137	19.1651
0.0	0.02	0.10	26.17	59.23	0.3019	0.3129	6.86	7.15	0.3539	0.4135	0.0424	0.0463	24.1834	16.9135
0.0	0.02	0.20	33.94	64.95	0.3046	0.3188	1.71	1.38	0.0554	0.4922	0.0362	0.0401	25.8503	16.4169
0.0	0.02	0.50	45.21	73.05	0.3163	0.3323	-5.57	-3.51	-0.1070	0.5934	0.0294	0.0319	24.5631	15.6733
0.0	0.02	0.80	48.82	75.36	0.3229	0.3378	-7.82	-4.63	-0.1355	0.6383	0.0269	0.0289	22.9335	15.0263
0.0	0.02	0.80	48.82	75.36	0.3229	0.3378	6.40	9.34	0.5899	0.5550	0.0252	0.0254	11.3094	10.6061
0.0	0.05	0.05	17.03	48.33	0.2798	0.2847	7.92	8.13	0.4040	0.4367	0.0341	0.0356	18.3076	13.8339
0.0	0.05	0.10	27.23	59.22	0.2937	0.3021	2.77	2.21	0.0353	0.5660	0.0294	0.0312	20.4793	12.2032
0.0	0.05	0.20	35.00	65.78	0.2979	0.3099	-4.51	-2.83	-0.0381	0.6314	0.0235	0.0242	19.5949	12.2673
0.0	0.05	0.50	46.26	73.74	0.3104	0.3247	-6.76	-3.98	-0.1186	0.7269	0.0211	0.0215	18.1196	11.6749
0.0	0.05	0.80	49.87	76.01	0.3171	0.3303	5.27	5.61	0.2662	0.6986	0.0152	0.0148	7.0362	6.7671
0.0	0.10	0.10	24.58	56.70	0.2748	0.2813	4.25	3.35	0.1279	0.6481	0.0229	0.0217	14.4307	9.2624
0.0	0.10	0.20	36.48	66.92	0.2904	0.3004	-3.03	-1.88	-0.0612	0.7748	0.0160	0.0158	13.7277	8.3373
0.0	0.10	0.50	47.75	74.69	0.3037	0.3162	-5.28	-3.08	-0.0944	0.8269	0.0144	0.0132	12.3511	7.6205
0.0	0.10	0.80	51.35	76.91	0.3104	0.3220	3.59	2.85	0.1074	0.8261	0.0082	0.0074	4.0301	3.7003
0.0	0.20	0.20	35.82	66.41	0.2766	0.2861	-0.87	-0.53	-0.0208	0.8539	0.0097	0.0075	7.3703	4.2075
0.0	0.20	0.50	49.91	76.03	0.2966	0.3080	-3.12	-1.60	-0.0581	0.9235	0.0072	0.0050	6.0569	3.7673
0.0	0.20	0.80	53.51	78.29	0.3032	0.3138	1.17	0.70	0.0210	0.9422	0.0026	0.0019	1.7733	1.1634
0.0	0.50	0.50	51.94	77.27	0.2895	0.3023	-0.17	-0.09	-0.0058	0.9650	0.0020	0.0006	1.4729	0.6667
0.0	0.50	0.80	56.47	79.90	0.2980	0.3095	0.39	0.22	0.0058	0.9753	0.0010	0.0006	0.7029	0.6651
0.0	0.80	0.80	57.03	80.21	0.2970	0.3095								

Exhibit A-6 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KD = 2.0
THETA = 135.

REFLECT	HP/HV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	81.80	92.49	0.3438	0.3543	-13.11	-5.51	-0.1338	0.6699	0.0110	0.0114	10.9272	8.4020
1.0	0.02	0.05	69.65	86.04	0.3508	0.3602	-21.95	-9.82	-0.2330	0.7853	0.0195	0.0197	18.4478	14.6627
1.0	0.02	0.10	66.75	85.39	0.3485	0.3573	-20.11	-9.29	-0.2245	0.7683	0.0198	0.0206	18.6935	14.3963
1.0	0.02	0.20	62.35	83.11	0.3439	0.3524	-17.35	-8.44	-0.2098	0.7437	0.0206	0.0223	19.4832	14.4729
1.0	0.02	0.50	55.78	79.51	0.3334	0.3437	-13.30	-7.05	-0.1832	0.7036	0.0230	0.0260	21.6421	15.1459
1.0	0.02	0.80	53.58	78.24	0.3230	0.3405	-11.98	-6.55	-0.1733	0.6885	0.0245	0.0277	22.8256	15.5627
1.0	0.05	0.05	79.97	91.68	0.3393	0.3483	-11.63	-4.98	-0.1234	0.9334	0.0030	0.0078	8.4145	6.6837
1.0	0.05	0.10	68.08	86.06	0.3422	0.3498	-18.78	-8.62	-0.2106	0.8093	0.0135	0.0131	14.0118	11.2776
1.0	0.05	0.20	63.63	83.81	0.3375	0.3447	-16.02	-7.74	-0.1947	0.8504	0.0142	0.0146	14.4466	11.1294
1.0	0.05	0.50	57.11	80.26	0.3269	0.3357	-11.97	-6.30	-0.1658	0.8156	0.0166	0.0181	16.3052	11.5193
1.0	0.05	0.80	54.91	79.01	0.3215	0.3325	-10.65	-5.78	-0.1551	0.7919	0.0180	0.0196	17.6154	11.8726
1.0	0.10	0.10	77.33	90.48	0.3329	0.3403	-9.53	-4.20	-0.1071	0.9996	0.0042	0.0036	5.5014	4.7362
1.0	0.10	0.20	65.54	84.78	0.3301	0.3361	-14.15	-6.78	-0.1731	0.9207	0.0063	0.0060	8.9278	7.7222
1.0	0.10	0.50	58.98	81.30	0.3195	0.3269	-10.10	-5.26	-0.1419	0.9363	0.0091	0.0093	10.1135	7.5141
1.0	0.10	0.80	56.78	80.08	0.3142	0.3236	-8.79	-4.71	-0.1290	0.9034	0.0107	0.0108	11.0037	7.7077
1.0	0.20	0.20	73.27	88.59	0.3233	0.3294	-6.43	-2.97	-0.0790	1.0545	-0.0001	-0.0007	2.9910	2.9032
1.0	0.20	0.50	61.71	82.77	0.3116	0.3184	-7.37	-3.78	-0.1038	1.0533	0.0013	0.0007	4.1601	3.0037
1.0	0.20	0.80	59.51	81.59	0.3065	0.3151	-6.06	-3.20	-0.0900	1.0202	0.0030	0.0022	4.5028	3.6709
1.0	0.50	0.50	67.05	85.54	0.3081	0.3157	-2.03	-1.01	-0.0231	1.0546	-0.0022	-0.0020	1.0905	1.4029
1.0	0.50	0.80	63.27	83.60	0.3013	0.3108	-2.30	-1.19	-0.0337	1.0669	-0.0022	-0.0021	1.9315	1.5191
1.0	0.80	0.80	64.90	84.45	0.3023	0.3120	-0.67	-0.34	-0.0091	1.0303	-0.0013	-0.0008	0.9233	0.6033
0.3	0.02	0.02	32.63	63.89	0.3278	0.3369	0.77	0.63	0.0297	0.9473	0.0068	0.0068	4.1479	2.8372
0.3	0.02	0.05	35.40	66.09	0.3272	0.3369	-0.06	-0.04	0.0089	0.7714	0.0182	0.0198	12.3221	8.2372
0.3	0.02	0.10	38.43	68.36	0.3219	0.3329	-2.12	-1.52	-0.0411	0.6350	0.0235	0.0266	17.7747	11.7333
0.3	0.02	0.20	42.93	71.53	0.3179	0.3310	-5.16	-3.37	-0.0961	0.6411	0.0267	0.0307	22.5743	14.7135
0.3	0.02	0.50	49.38	75.71	0.3190	0.3348	-9.41	-5.48	-0.1503	0.6432	0.0269	0.0305	24.6161	16.1434
0.3	0.02	0.80	51.41	76.95	0.3216	0.3375	-10.70	-6.04	-0.1632	0.6545	0.0262	0.0294	24.1515	16.0197
0.3	0.05	0.05	36.15	66.66	0.3142	0.3220	0.69	0.53	0.0237	0.9594	0.0052	0.0050	3.3330	2.1837
0.3	0.05	0.10	39.76	69.32	0.3137	0.3226	-0.79	-0.56	-0.0115	0.8994	0.0152	0.0163	11.3722	7.3014
0.3	0.05	0.20	44.26	72.43	0.3107	0.3219	-3.03	-2.40	-0.0712	0.7433	0.0196	0.0216	16.6156	10.6196
0.3	0.05	0.50	50.71	76.52	0.3126	0.3266	-8.08	-4.67	-0.1301	0.7392	0.0206	0.0222	19.0796	12.3719
0.3	0.05	0.80	52.74	77.74	0.3152	0.3294	-9.36	-5.24	-0.1441	0.7522	0.0199	0.0212	18.6997	12.3045
0.3	0.10	0.10	41.14	70.30	0.3021	0.3095	0.59	0.41	0.0170	0.9693	0.0036	0.0033	2.4396	1.5218
0.3	0.10	0.20	46.13	73.65	0.3028	0.3121	-1.96	-1.25	-0.0357	0.8578	0.0116	0.0119	9.6799	5.9955
0.3	0.10	0.50	52.58	77.65	0.3054	0.3176	-6.21	-3.53	-0.1013	0.8467	0.0134	0.0132	12.5873	8.0712
0.3	0.10	0.80	54.61	78.84	0.3081	0.3205	-7.50	-4.15	-0.1168	0.8616	0.0127	0.0123	12.3109	8.0918
0.3	0.20	0.20	48.51	75.17	0.2932	0.3019	0.42	0.26	0.0097	0.9800	0.0020	0.0016	1.4111	0.8543
0.3	0.20	0.50	55.31	79.24	0.2980	0.3090	-3.48	-1.95	-0.0580	0.9482	0.0039	0.0046	5.5968	3.5764
0.3	0.20	0.80	57.34	80.39	0.3006	0.3119	-4.77	-2.60	-0.0759	0.9653	0.0053	0.0037	5.4306	3.7665
0.3	0.50	0.50	58.94	81.28	0.2926	0.3047	0.15	0.08	0.0024	0.9923	0.0006	0.0003	0.4020	0.2401
0.3	0.50	0.80	61.10	82.45	0.2957	0.3077	-1.01	-0.54	-0.0170	1.0052	0.0003	-0.0005	0.7575	0.6586
0.3	0.80	0.80	62.16	83.02	0.2956	0.3083	0.66	0.03	0.0007	0.9965	0.0002	0.0001	0.1433	0.0866
0.0	0.02	0.02	11.55	40.54	0.2875	0.2934	6.71	14.22	1.4012	0.3997	0.0394	0.0418	15.3839	15.5051
0.0	0.02	0.05	20.72	52.68	0.2982	0.3081	9.32	12.39	0.8381	0.3574	0.0471	0.0519	22.3517	18.2887

Exhibit A-6 (continued)

0.0	0.02	0.10	26.29	58.35	0.2969	0.3099	5.58	5.68	0.2857	0.4211	0.0409	0.0464	24.6836	16.8137
0.0	0.02	0.20	34.61	65.47	0.2998	0.3162	0.06	0.05	0.0147	0.4999	0.0352	0.0403	27.0460	17.0263
0.0	0.02	0.50	46.64	73.98	0.3119	0.3303	-7.74	-4.72	-0.1327	0.5992	0.0292	0.0329	26.2363	16.7782
0.0	0.02	0.80	50.48	76.39	0.3187	0.3362	-10.14	-5.81	-0.1586	0.6367	0.0270	0.0301	24.7641	16.2394
0.0	0.05	0.05	17.37	48.77	0.2743	0.2803	5.97	8.48	0.5278	0.5731	0.0232	0.0241	10.4605	9.7546
0.0	0.05	0.10	27.62	59.53	0.2881	0.2982	6.91	6.91	0.3434	0.5007	0.0321	0.0347	18.4392	13.1706
0.0	0.05	0.20	35.94	66.50	0.2927	0.3063	1.39	1.08	0.0491	0.5776	0.0280	0.0308	20.9562	13.0150
0.0	0.05	0.50	47.97	74.83	0.3056	0.3221	-6.41	-3.87	-0.1110	0.6889	0.0229	0.0245	20.6372	12.9826
0.0	0.05	0.80	51.81	77.19	0.3124	0.3280	-8.81	-5.00	-0.1391	0.7312	0.0207	0.0219	19.3913	12.5178
0.0	0.10	0.10	25.63	57.72	0.2696	0.2771	4.92	5.05	0.2382	0.7158	0.0136	0.0137	7.2358	6.1623
0.0	0.10	0.20	37.81	67.90	0.2849	0.2964	3.26	2.48	0.0982	0.6665	0.0203	0.0208	14.1645	8.8663
0.0	0.10	0.50	49.84	75.99	0.2986	0.3130	-4.54	-2.71	-0.0800	0.7866	0.0158	0.0153	14.1333	8.6659
0.0	0.10	0.80	53.68	78.30	0.3034	0.3190	-6.94	-3.90	-0.1112	0.8369	0.0137	0.0130	12.9040	8.2914
0.0	0.20	0.20	37.90	67.97	0.2719	0.2824	3.35	2.55	0.0961	0.8389	0.0072	0.0067	4.4203	3.4128
0.0	0.20	0.50	52.57	77.64	0.2914	0.3045	-1.81	-1.06	-0.0335	0.8763	0.0036	0.0069	7.1806	4.1291
0.0	0.20	0.80	56.41	79.37	0.2980	0.3103	-4.21	-2.33	-0.0695	0.9365	0.0063	0.0044	6.0503	3.9173
0.0	0.50	0.50	55.46	79.33	0.2850	0.2993	1.09	0.63	0.0188	0.9473	0.0023	0.0017	1.5637	1.0549
0.0	0.50	0.80	60.17	81.95	0.2932	0.3064	-0.46	-0.25	-0.0093	0.9730	0.0015	0.0003	1.2318	0.7582
.0	0.80	0.80	60.99	82.39	0.2926	0.3066	0.36	0.20	0.0052	0.9780	0.0009	0.0005	0.6252	0.3942

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 2.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	1.	0.00	90.6	51.00	80.90	92.10	0.3674	0.3744	-24.02	-9.77	-0.2291	0.6326	0.0485	0.0433	41.2763	28.131
	1.	0.02	89.6	51.57	82.90	92.98	0.3592	0.3655	-22.08	-8.92	-0.2113	0.5332	0.0401	0.0344	34.7454	23.293
	1.	0.05	88.2	52.32	85.58	94.14	0.3498	0.3555	-19.47	-7.78	-0.1883	0.6527	0.0306	0.0244	27.0034	17.830
	1.	0.10	86.3	53.36	89.35	95.73	0.3392	0.3449	-15.80	-6.23	-0.1547	0.7900	0.0193	0.0136	17.9845	11.809
	1.	0.20	83.6	54.83	94.86	97.98	0.3282	0.3348	-10.46	-4.04	-0.1045	0.9284	0.0034	0.0035	8.3634	5.787
	1.	0.50	93.4	49.53	102.46	103.94	0.3206	0.3301	-3.12	-1.17	-0.0323	1.0056	0.0001	-0.0014	1.6739	1.492
	1.	0.80	148.3	19.81	104.71	101.79	0.3203	0.3308	-0.97	-0.36	-0.0100	1.0032	-0.0003	-0.0007	0.6760	0.536

Exhibit A-6 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 2.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.																
	1.	0.00	96.7	47.76	40.70	69.99	0.3512	0.3599	-18.79	-11.58	-0.3211	0.4660	0.0494	0.0466	37.4636	25.919
	1.	0.02	95.0	48.65	42.29	71.03	0.3412	0.3483	-17.29	-10.54	-0.2969	0.5044	0.0393	0.0353	30.9213	21.173
	1.	0.05	92.8	49.82	44.21	72.39	0.3303	0.3364	-15.28	-9.18	-0.2641	0.7019	0.0233	0.0232	23.3275	16.099
	1.	0.10	89.9	51.39	47.05	74.25	0.3167	0.3242	-12.44	-7.33	-0.2172	0.8340	0.0166	0.0110	15.6017	10.557
	1.	0.20	85.9	53.59	51.22	76.83	0.3076	0.3138	-8.28	-4.75	-0.1470	0.9244	0.0054	0.0006	6.3566	5.484
	1.	0.50	93.4	49.53	57.01	80.20	0.3013	0.3105	-2.52	-1.40	-0.0455	1.0411	-0.0013	-0.0027	2.0369	1.782
	1.	0.80	148.3	19.31	58.74	81.17	0.3017	0.3120	-0.80	-0.44	-0.0141	1.0221	-0.0010	-0.0012	0.9106	0.677

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 2.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
	1.	0.00	101.2	45.31	38.92	68.72	0.3499	0.3620	-25.07	-15.25	-0.3830	0.4309	0.0518	0.0511	41.6979	29.505
	1.	0.02	99.0	46.47	40.68	70.11	0.3377	0.3479	-23.09	-13.85	-0.3544	0.5089	0.0396	0.0370	33.8366	23.939
	1.	0.05	96.3	47.97	43.51	71.93	0.3250	0.3336	-20.43	-12.02	-0.3153	0.7246	0.0268	0.0227	25.0572	17.879
	1.	0.10	92.5	49.97	47.23	74.36	0.3122	0.3199	-16.67	-9.57	-0.2596	0.8932	0.0140	0.0091	15.6558	11.082
	1.	0.20	87.5	52.71	52.69	77.71	0.3009	0.3090	-11.14	-6.18	-0.1753	1.0394	0.0026	-0.0017	7.1735	6.547
	1.	0.50	93.4	49.52	60.33	82.03	0.2957	0.3068	-3.43	-1.82	-0.0545	1.0556	-0.0027	-0.0037	2.0596	2.360
	1.	0.80	148.3	19.31	62.63	83.26	0.2968	0.3089	-1.09	-0.57	-0.0169	1.0336	-0.0016	-0.0015	1.3069	0.917

Exhibit A-6 (concluded)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1609 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 3015.
SIGMA Z (M) = 187.
SO2-SO4 CONVERSION RATE= 0.0035 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0245 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/B (%)
H+2S												
INCREMENT!	0.016	0.011	0.000	68.943	0.599	0.003	0.016	0.126	-0.010	1.123	0.014	3.210
TOTAL AMB!	0.016	0.011	0.000	68.944	0.599	0.003	2.952	18.654	0.023	14.059	0.143	50.083
H+1S												
INCREMENT!	0.072	0.038	0.000	52.698	0.037	0.015	0.010	0.017	-0.024	5.031	0.063	0.463
TOTAL AMB!	0.072	0.038	0.000	52.698	0.037	0.015	2.946	4.854	0.014	17.967	0.191	48.873
H												
INCREMENT!	0.119	0.058	0.000	48.437	0.030	0.024	0.009	0.010	-0.026	8.296	0.103	0.254
TOTAL AMB!	0.119	0.058	0.000	48.437	0.030	0.024	2.945	3.009	0.012	21.232	0.232	36.181
H-1S												
INCREMENT!	0.073	0.038	0.000	52.510	0.037	0.015	0.010	0.017	-0.024	5.031	0.063	0.445
TOTAL AMB!	0.073	0.038	0.000	52.510	0.037	0.015	2.946	4.853	0.014	13.647	0.192	48.750
H-2S												
INCREMENT!	0.027	0.017	0.000	64.448	0.379	0.003	0.013	0.034	-0.015	1.359	0.024	2.157
TOTAL AMB!	0.027	0.017	0.000	64.448	0.379	0.003	2.954	13.113	0.023	14.804	0.152	56.206
0												
INCREMENT!	0.026	0.017	0.000	63.043	0.420	0.003	0.020	0.093	-0.017	1.839	0.023	2.224
TOTAL AMB!	0.026	0.017	0.000	63.043	0.420	0.003	2.956	12.292	0.021	14.775	0.183	55.466

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-7. Printout from plume-based PLUVUE calculations for observed points at 100 and 120 km from the source.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	30.	0.02	178.2	3.67	87.42	94.92	0.3618	0.3706	-17.49	-6.94	-0.1644	0.5275	0.0429	0.0396	37.5565	25.14
	30.	0.05	175.3	5.25	85.54	94.12	0.3622	0.3677	-19.37	-7.74	-0.1855	0.5626	0.0483	0.0366	37.0310	24.48
	30.	0.10	172.3	6.85	83.73	93.53	0.3626	0.3643	-17.18	-6.82	-0.1630	0.7014	0.0316	0.0234	27.3676	17.57
	30.	0.20	169.3	8.48	93.70	97.51	0.3333	0.3383	-11.21	-4.35	-0.1131	0.8537	0.0144	0.0075	13.0677	8.20
	30.	0.50	165.3	10.67	101.79	100.69	0.3205	0.3301	-3.11	-1.18	-0.0339	0.9905	0.0016	-0.0010	2.5505	1.78
	30.	0.80	164.1	11.31	104.11	101.57	0.3192	0.3305	-0.80	-0.30	-0.0094	0.9932	0.0003	-0.0006	0.7136	0.55
	45.	0.02	180.0	2.70	90.12	96.05	0.3561	0.3671	-14.79	-5.81	-0.1371	0.5564	0.0373	0.0361	33.6641	22.50
	45.	0.05	177.8	3.89	88.60	95.42	0.3566	0.3651	-16.31	-6.45	-0.1540	0.5376	0.0373	0.0369	33.3335	22.04
	45.	0.10	176.3	4.71	91.77	96.73	0.3441	0.3515	-13.13	-5.13	-0.1264	0.7421	0.0252	0.0204	22.5592	14.67
	45.	0.20	174.1	5.90	96.36	98.58	0.3307	0.3383	-8.55	-3.29	-0.0851	0.8990	0.0119	0.0072	10.8250	6.81
	45.	0.50	171.1	7.51	102.54	100.97	0.3203	0.3305	-2.37	-0.89	-0.0255	0.9920	0.0014	-0.0005	1.8270	1.25
	45.	0.80	170.2	7.99	104.31	101.64	0.3191	0.3307	-0.60	-0.23	-0.0071	0.9950	0.0003	-0.0004	0.5404	0.41
	60.	0.02	180.8	2.28	91.64	96.67	0.3526	0.3644	-13.27	-5.19	-0.1223	0.5318	0.0337	0.0334	30.9905	20.66
	60.	0.05	179.2	3.13	91.11	96.46	0.3509	0.3608	-13.69	-5.41	-0.1293	0.6309	0.0320	0.0293	29.6143	19.10
	60.	0.10	178.0	3.80	93.79	97.55	0.3405	0.3493	-11.11	-4.31	-0.1061	0.7665	0.0217	0.0153	19.7729	12.67
	60.	0.20	176.2	4.70	97.68	99.10	0.3292	0.3378	-7.23	-2.77	-0.0715	0.9091	0.0104	0.0057	9.5234	6.28
	60.	0.50	173.7	6.12	102.91	101.11	0.3201	0.3307	-2.00	-0.75	-0.0214	0.9929	0.0013	-0.0003	1.5632	1.19
	60.	0.80	172.9	6.52	104.40	101.68	0.3191	0.3307	-0.51	-0.19	-0.0059	0.9953	0.0002	-0.0003	0.4555	0.26
	90.	0.02	181.3	2.00	92.84	97.16	0.3495	0.3619	-12.07	-4.70	-0.1107	0.6073	0.0307	0.0303	28.6053	19.02
	90.	0.05	180.0	2.69	92.69	97.10	0.3473	0.3580	-12.22	-4.76	-0.1139	0.6613	0.0264	0.0269	26.1426	17.15
	90.	0.10	179.0	3.27	95.07	98.06	0.3382	0.3473	-9.84	-3.80	-0.0935	0.7874	0.0193	0.0167	17.8776	11.44
	90.	0.20	177.4	4.12	98.52	99.42	0.3282	0.3373	-6.39	-2.44	-0.0629	0.9164	0.0093	0.0063	8.6933	5.41
	90.	0.50	175.2	5.29	103.15	101.20	0.3200	0.3303	-1.76	-0.66	-0.0180	0.9935	0.0012	-0.0002	1.3944	1.00
	90.	0.80	174.6	5.64	104.46	101.70	0.3191	0.3303	-0.45	-0.17	-0.0052	0.9963	0.0002	-0.0003	0.4622	0.30
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.11	178.3	3.35	95.39	98.19	0.3372	0.3466	-9.52	-3.68	-0.0907	0.8913	0.0183	0.0155	16.2966	10.79
90.																
	30.	0.02	178.8	3.33	48.73	75.31	0.3443	0.3562	-10.75	-6.27	-0.1752	0.5313	0.0425	0.0429	33.3333	22.23
	30.	0.05	176.0	4.86	47.57	74.58	0.3444	0.3328	-11.91	-7.00	-0.1979	0.5669	0.0426	0.0395	32.5850	21.40
	30.	0.10	173.0	6.49	48.90	75.41	0.3323	0.3360	-10.53	-6.16	-0.1796	0.7114	0.0305	0.0243	23.6900	15.24
	30.	0.20	169.8	8.24	52.54	77.62	0.3151	0.3207	-6.94	-3.95	-0.1217	0.8957	0.0134	0.0075	10.9486	7.05
	30.	0.50	165.5	10.56	57.46	80.46	0.3029	0.3119	-2.02	-1.12	-0.0331	0.9990	0.0011	-0.0014	1.9156	1.50
	30.	0.80	164.2	11.24	58.87	81.24	0.3018	0.3124	-0.62	-0.34	-0.0122	0.9939	0.0000	-0.0003	0.6569	0.56
	45.	0.02	180.5	2.44	50.39	76.33	0.3387	0.3523	-9.09	-5.24	-0.1462	0.5392	0.0369	0.0391	29.9757	19.95
	45.	0.05	178.4	3.57	49.43	75.75	0.3390	0.3499	-10.03	-5.82	-0.1643	0.5924	0.0372	0.0367	29.4767	19.43
	45.	0.10	176.8	4.46	51.39	76.94	0.3261	0.3349	-8.09	-4.64	-0.1351	0.7495	0.0244	0.0217	19.6723	12.62
	45.	0.20	174.4	5.72	54.19	78.59	0.3128	0.3206	-5.30	-2.93	-0.0915	0.9076	0.0111	0.0073	9.1657	5.92
	45.	0.50	171.3	7.43	57.93	80.73	0.3028	0.3124	-1.53	-0.85	-0.0266	0.9931	0.0010	-0.0003	1.4744	1.10
	45.	0.80	170.3	7.93	59.02	81.32	0.3018	0.3126	-0.47	-0.26	-0.0092	0.9991	0.0001	-0.0006	0.4892	0.41

Exhibit A-7 (continued)

60.	0.02	181.2	2.05	51.32	76.89	0.3352	0.3493	-8.16	-4.68	-0.1303	0.5342	0.0334	0.0361	27.6261	18.[illegible]
60.	0.05	179.7	2.88	50.99	76.70	0.3333	0.3453	-8.49	-4.83	-0.1379	0.6352	0.0315	0.0321	25.6931	16.665
60.	0.10	178.4	3.59	52.64	77.68	0.3227	0.3326	-6.85	-3.89	-0.1133	0.7746	0.0210	0.0194	17.2924	11.032
60.	0.20	176.4	4.63	55.01	79.06	0.3115	0.3201	-4.48	-2.51	-0.0769	0.9163	0.0097	0.0069	8.1018	5.125
60.	0.50	173.8	6.05	58.19	80.86	0.3027	0.3127	-1.29	-0.71	-0.0240	0.9939	0.0010	-0.0006	1.2576	0.897
60.	0.80	173.0	6.47	59.09	81.36	0.3018	0.3127	-0.39	-0.21	-0.0077	0.9992	0.0001	-0.0005	0.4089	0.343
90.	0.02	181.7	1.79	52.06	77.34	0.3321	0.3465	-7.42	-4.24	-0.1180	0.6097	0.0304	0.0333	25.5184	16.902
90.	0.05	180.4	2.47	51.97	77.28	0.3297	0.3421	-7.52	-4.29	-0.1214	0.6652	0.0279	0.0289	23.1699	15.165
90.	0.10	179.3	3.09	53.42	78.14	0.3205	0.3309	-6.06	-3.43	-0.0999	0.7923	0.0187	0.0177	15.6660	10.023
90.	0.20	177.6	3.99	55.52	79.36	0.3103	0.3197	-3.96	-2.21	-0.0677	0.9227	0.0093	0.0064	7.3656	4.660
90.	0.50	175.3	5.23	58.34	80.95	0.3027	0.3123	-1.14	-0.63	-0.0212	0.9979	0.0009	-0.0004	1.1203	0.870
90.	0.80	174.6	5.60	59.14	81.38	0.3018	0.3123	-0.35	-0.19	-0.0063	0.9993	0.0001	-0.0004	0.3591	0.303

OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE

90.	0.11	179.1	3.17	53.62	78.26	0.3194	0.3297	-5.87	-3.32	-0.0970	0.8074	0.0177	0.0165	14.7775	9.435

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RVO	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
30.	0.02	179.3	3.11	51.79	77.18	0.3404	0.3547	-12.20	-6.30	-0.1625	0.5317	0.0423	0.0437	34.9350	23.133
30.	0.05	176.5	4.59	50.46	76.37	0.3403	0.3510	-13.53	-7.60	-0.2063	0.5711	0.0422	0.0401	34.0469	22.347
30.	0.10	173.4	6.25	51.94	77.27	0.3280	0.3353	-12.05	-6.71	-0.1875	0.7166	0.0299	0.0243	24.5769	15.759
30.	0.20	170.1	8.06	56.05	79.66	0.3108	0.3181	-7.95	-4.32	-0.1276	0.9030	0.0127	0.0072	11.1844	7.263
30.	0.50	165.6	10.48	61.59	82.71	0.2988	0.3093	-2.40	-1.26	-0.0411	1.0046	0.0008	-0.0017	2.0008	1.747
30.	0.80	164.3	11.18	63.19	83.56	0.2979	0.3099	-0.81	-0.42	-0.0143	1.0028	-0.0002	-0.0010	0.7734	0.661
45.	0.02	180.3	2.25	53.68	78.30	0.3348	0.3508	-10.31	-5.68	-0.1522	0.5592	0.0367	0.0393	31.4440	20.778
45.	0.05	178.8	3.36	52.60	77.66	0.3350	0.3482	-11.39	-6.32	-0.1712	0.5938	0.0369	0.0373	30.5394	20.199
45.	0.10	177.1	4.28	54.79	78.94	0.3220	0.3327	-9.21	-5.04	-0.1410	0.7532	0.0239	0.0218	20.4521	13.065
45.	0.20	174.7	5.59	57.93	80.72	0.3087	0.3181	-6.06	-3.26	-0.0960	0.9129	0.0106	0.0071	9.4025	5.999
45.	0.50	171.4	7.37	62.17	83.02	0.2988	0.3099	-1.82	-0.96	-0.0309	1.0022	0.0008	-0.0010	1.5249	1.279
45.	0.80	170.4	7.89	63.38	83.66	0.2980	0.3102	-0.61	-0.32	-0.0103	1.0019	-0.0001	-0.0007	0.5696	0.490
60.	0.02	181.5	1.89	54.74	78.91	0.3312	0.3477	-9.26	-5.07	-0.1357	0.5841	0.0302	0.0367	23.9854	19.105
60.	0.05	180.0	2.71	54.36	78.69	0.3293	0.3433	-9.64	-5.29	-0.1437	0.6364	0.0312	0.0325	26.8371	17.639
60.	0.10	178.6	3.45	56.20	79.75	0.3186	0.3304	-7.79	-4.23	-0.1134	0.7777	0.0206	0.0195	17.9945	11.479
60.	0.20	176.6	4.52	58.87	81.24	0.3074	0.3177	-5.12	-2.74	-0.0806	0.9203	0.0093	0.0067	8.3267	5.231
60.	0.50	173.9	6.00	62.46	83.17	0.2988	0.3102	-1.53	-0.80	-0.0259	1.0013	0.0008	-0.0007	1.2948	1.071
60.	0.80	173.1	6.44	63.48	83.71	0.2980	0.3103	-0.51	-0.27	-0.0091	1.0015	-0.0001	-0.0005	0.4736	0.409
90.	0.02	182.0	1.65	55.53	79.39	0.3282	0.3443	-8.42	-4.59	-0.1229	0.6095	0.0302	0.0339	26.7694	17.597
90.	0.05	180.7	2.32	55.46	79.33	0.3257	0.3403	-8.53	-4.65	-0.1265	0.6662	0.0276	0.0293	24.2495	15.762
90.	0.10	179.5	2.96	57.10	80.25	0.3164	0.3287	-6.90	-3.72	-0.1043	0.7955	0.0184	0.0178	16.3044	10.282
90.	0.20	177.8	3.90	59.46	81.56	0.3063	0.3173	-4.53	-2.42	-0.0710	0.9264	0.0083	0.0063	7.5785	4.791
90.	0.50	175.4	5.19	62.64	83.27	0.2988	0.3103	-1.35	-0.71	-0.0228	1.0003	0.0007	-0.0006	1.1504	0.942
90.	0.80	174.7	5.57	63.54	83.74	0.2980	0.3104	-0.45	-0.24	-0.0080	1.0013	-0.0000	-0.0005	0.4145	0.353

OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE

90.	0.11	179.4	3.05	57.32	80.37	0.3154	0.3273	-6.68	-3.60	-0.1013	0.8102	0.0173	0.0165	15.3730	9.769

Exhibit A-7 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.															
	30.	15.	2.95	39.24	68.95	0.3342	0.3541	-2.36	-1.67	-0.0379	0.2441	0.0734	0.0831	57.1431	36.6855
	30.	30.	1.41	27.66	59.61	0.3374	0.3552	3.45	3.29	0.1654	0.1783	0.0347	0.0963	54.1859	36.2537
	30.	45.	0.88	23.42	55.54	0.3415	0.3577	5.65	6.28	0.3417	0.1502	0.0914	0.1030	51.7687	35.8701
	30.	60.	0.60	21.42	53.45	0.3447	0.3600	6.66	8.10	0.4760	0.1343	0.0958	0.1072	50.4433	35.6302
	30.	75.	0.44	20.47	52.40	0.3468	0.3616	7.13	9.09	0.5596	0.1263	0.0935	0.1097	49.8565	35.9375
	30.	90.	0.39	20.18	52.07	0.3475	0.3622	7.26	9.40	0.5878	0.1235	0.0994	0.1106	49.7076	36.0048
	45.	15.	2.10	39.23	68.96	0.3190	0.3410	-2.35	-1.66	-0.0365	0.3134	0.0582	0.0700	43.1614	30.7729
	45.	30.	1.04	26.50	53.54	0.3192	0.3388	2.30	2.22	0.1181	0.2475	0.0666	0.0799	44.7287	29.7040
	45.	45.	0.68	21.63	53.88	0.3220	0.3399	4.03	4.62	0.2524	0.2157	0.0719	0.0852	42.2592	29.0379
	45.	60.	0.51	19.64	51.47	0.3243	0.3413	4.83	6.12	0.3355	0.1979	0.0755	0.0885	40.8270	28.7604
	45.	75.	0.42	18.61	50.26	0.3258	0.3423	5.27	6.95	0.4202	0.1886	0.0775	0.0904	40.0954	28.6684
	45.	90.	0.39	18.30	49.90	0.3263	0.3426	5.39	7.22	0.4422	0.1856	0.0781	0.0910	39.8722	28.6498
	60.	15.	1.73	39.40	69.07	0.3104	0.3324	-2.20	-1.56	-0.0337	0.3658	0.0496	0.0614	42.5018	27.0508
	60.	30.	0.88	26.01	58.08	0.3093	0.3286	1.81	1.76	0.0969	0.2994	0.0566	0.0697	39.1425	25.8316
	60.	45.	0.60	21.11	53.10	0.3114	0.3291	3.33	3.84	0.2104	0.2650	0.0613	0.0744	36.8215	25.1951
	60.	60.	0.47	18.81	50.50	0.3133	0.3301	4.05	5.16	0.2977	0.2453	0.0645	0.0774	35.6591	24.8836
	60.	75.	0.41	17.73	49.21	0.3145	0.3309	4.39	5.89	0.3525	0.2349	0.0663	0.0790	34.7466	24.7581
	60.	90.	0.39	17.41	48.81	0.3150	0.3312	4.49	6.13	0.3713	0.2316	0.0668	0.0795	34.5249	24.7254
	90.	15.	1.51	39.54	69.17	0.3047	0.3263	-2.06	-1.46	-0.0312	0.4065	0.0439	0.0553	38.5384	24.4618
	90.	30.	0.78	25.73	57.82	0.3028	0.3215	1.53	1.49	0.0842	0.3401	0.0501	0.0627	35.3217	23.2927
	90.	45.	0.55	20.67	52.62	0.3044	0.3217	2.90	3.37	0.1845	0.3039	0.0544	0.0670	33.1484	22.6265
	90.	60.	0.43	18.30	49.90	0.3061	0.3225	3.54	4.56	0.2618	0.2828	0.0573	0.0697	31.8691	22.3178
	90.	75.	0.41	17.19	48.53	0.3072	0.3231	3.85	5.22	0.3104	0.2716	0.0589	0.0712	31.1957	22.1825
	90.	90.	0.39	16.86	48.12	0.3076	0.3234	3.94	5.44	0.3269	0.2681	0.0595	0.0717	30.9853	22.1536
90.															
	30.	15.	2.95	22.96	55.06	0.3188	0.3407	-3.38	-3.32	-0.1051	0.2634	0.0690	0.0840	49.0051	32.2512
	30.	30.	1.41	15.74	46.67	0.3207	0.3406	0.35	0.47	0.0493	0.1983	0.0765	0.0960	44.9051	31.0606
	30.	45.	0.88	13.08	42.93	0.3242	0.3427	1.77	2.78	0.1338	0.1693	0.0845	0.1023	41.9045	30.1564
	30.	60.	0.60	11.83	40.98	0.3271	0.3449	2.43	4.19	0.2860	0.1528	0.0885	0.1063	40.2193	29.7722
	30.	75.	0.44	11.23	40.01	0.3291	0.3465	2.73	4.96	0.3494	0.1435	0.0911	0.1089	39.4233	29.6812
	30.	90.	0.39	11.05	39.70	0.3299	0.3472	2.82	5.20	0.3707	0.1404	0.0920	0.1098	39.2116	29.6634
	45.	15.	2.10	23.43	55.55	0.3040	0.3269	-2.90	-2.84	-0.0867	0.3337	0.0542	0.0702	41.4014	27.1831
	45.	30.	1.04	15.46	46.30	0.3029	0.3233	0.03	0.10	0.0312	0.2718	0.0607	0.0787	37.1410	25.6014
	45.	45.	0.68	12.53	42.08	0.3049	0.3238	1.21	1.93	0.1339	0.2403	0.0652	0.0833	34.2264	24.5422
	45.	60.	0.51	11.15	39.87	0.3068	0.3248	1.75	3.08	0.2127	0.2228	0.0682	0.0863	32.5137	23.9878
	45.	75.	0.42	10.50	38.76	0.3080	0.3256	2.00	3.72	0.2621	0.2132	0.0700	0.0880	31.6229	23.7328
	45.	90.	0.39	10.30	38.42	0.3085	0.3259	2.07	3.92	0.2789	0.2101	0.0706	0.0886	31.3478	23.6605

Exhibit A-7 (continued)

60.	15.	1.73	23.75	55.87	0.2957	0.3180	-2.53	-2.51	-0.0757	0.3367	0.0439	0.0613	36.5601	23.9308
60.	30.	0.88	15.38	46.18	0.2933	0.3127	-0.01	-0.01	0.0240	0.3262	0.0511	0.0692	32.4939	22.3585
60.	45.	0.60	12.29	41.71	0.2946	0.3125	0.97	1.56	0.1110	0.3235	0.0549	0.0721	29.7914	21.3298
60.	60.	0.47	10.84	39.35	0.2961	0.3131	1.44	2.56	0.1773	0.2744	0.0575	0.0746	28.1045	20.7764
60.	75.	0.41	10.16	38.16	0.2971	0.3137	1.66	3.12	0.2198	0.2641	0.0591	0.0760	27.3325	20.5003
60.	90.	0.39	9.95	37.80	0.2975	0.3139	1.72	3.30	0.2342	0.2603	0.0596	0.0765	27.0656	20.4228
90.	15.	1.51	23.98	56.10	0.2903	0.3117	-2.35	-2.28	-0.0681	0.4276	0.0405	0.0550	33.1257	21.6679
90.	30.	0.78	15.34	46.13	0.2872	0.3055	-0.05	-0.07	0.0201	0.3633	0.0450	0.0610	29.8077	20.1893
90.	45.	0.55	12.15	41.49	0.2881	0.3049	0.83	1.34	0.0970	0.3343	0.0484	0.0645	26.7929	19.1704
90.	60.	0.45	10.63	39.03	0.2893	0.3053	1.23	2.24	0.1562	0.3147	0.0507	0.0668	25.0902	18.5837
90.	75.	0.41	9.95	37.79	0.2901	0.3057	1.43	2.74	0.1935	0.3033	0.0521	0.0681	24.1332	18.3781
90.	90.	0.39	9.74	37.41	0.2904	0.3059	1.51	2.90	0.2062	0.3003	0.0523	0.0683	24.2371	18.2985

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
PLUME ALTITUDE (M) = 392

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.															
	30.	15.	2.93	25.17	57.28	0.3155	0.3403	-5.32	-4.83	-0.1443	0.2666	0.0678	0.0851	52.6364	34.3734
	30.	30.	1.41	16.87	48.14	0.3165	0.3397	-0.99	-1.22	-0.0176	0.2034	0.0764	0.0963	48.1563	32.8479
	30.	45.	0.88	13.81	44.00	0.3197	0.3417	0.66	0.98	0.0927	0.1745	0.0820	0.1030	44.8394	31.6234
	30.	60.	0.60	12.36	41.83	0.3225	0.3440	1.43	2.33	0.1765	0.1577	0.0860	0.1071	42.9643	31.1581
	30.	75.	0.44	11.67	40.73	0.3246	0.3457	1.79	3.06	0.2283	0.1481	0.0883	0.1093	42.0704	30.9923
	30.	90.	0.39	11.46	40.38	0.3253	0.3464	1.89	3.29	0.2458	0.1448	0.0894	0.1103	41.8345	30.9736
	45.	15.	2.10	26.07	58.14	0.3006	0.3259	-4.42	-3.97	-0.1159	0.3389	0.0528	0.0707	44.4363	28.9076
	45.	30.	1.04	16.90	48.17	0.2986	0.3216	-0.96	-1.19	-0.0190	0.2303	0.0585	0.0787	39.8063	27.0445
	45.	45.	0.68	13.51	43.56	0.3002	0.3218	0.36	0.54	0.0636	0.2501	0.0623	0.0831	36.6244	25.7722
	45.	60.	0.51	11.91	41.12	0.3019	0.3227	0.99	1.62	0.1304	0.2322	0.0653	0.0859	34.7434	25.0760
	45.	75.	0.42	11.16	39.89	0.3030	0.3235	1.28	2.22	0.1711	0.2225	0.0670	0.0876	33.7593	24.7448
	45.	90.	0.39	10.93	39.51	0.3035	0.3238	1.37	2.42	0.1849	0.2194	0.0675	0.0881	33.4550	24.6475
	60.	15.	1.73	26.62	58.65	0.2923	0.3166	-3.87	-3.46	-0.1001	0.3931	0.0446	0.0614	39.1702	25.4168
	60.	30.	0.88	16.97	48.26	0.2892	0.3107	-0.89	-1.11	-0.0130	0.3366	0.0490	0.0673	34.7944	23.5882
	60.	45.	0.60	13.40	43.39	0.2900	0.3101	0.25	0.37	0.0536	0.3054	0.0523	0.0714	31.8574	22.3757
	60.	60.	0.47	11.72	40.81	0.2912	0.3106	0.79	1.31	0.1037	0.2866	0.0547	0.0738	30.1011	21.6932
	60.	75.	0.41	10.93	39.50	0.2921	0.3111	1.05	1.83	0.1434	0.2763	0.0561	0.0751	29.1651	21.3492
	60.	90.	0.39	10.69	39.10	0.2924	0.3113	1.13	2.00	0.1552	0.2731	0.0565	0.0756	28.8703	21.2445
	90.	15.	1.51	26.99	59.00	0.2870	0.3102	-3.50	-3.11	-0.0896	0.4346	0.0393	0.0550	35.4796	22.9830
	90.	30.	0.78	17.03	48.33	0.2831	0.3033	-0.83	-1.03	-0.0169	0.3798	0.0430	0.0604	31.3610	21.2354
	90.	45.	0.55	13.34	43.31	0.2836	0.3023	0.19	0.29	0.0465	0.3481	0.0459	0.0636	28.6334	20.0944
	90.	60.	0.45	11.61	40.62	0.2845	0.3023	0.63	1.13	0.0954	0.3287	0.0479	0.0657	26.9961	19.4457
	90.	75.	0.41	10.79	39.26	0.2852	0.3028	0.91	1.60	0.1262	0.3180	0.0492	0.0669	26.1184	19.1141
	90.	90.	0.39	10.53	38.84	0.2855	0.3030	0.98	1.75	0.1367	0.3146	0.0496	0.0673	25.8413	19.0123

Exhibit A-7 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
THETA = 45.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	92.91	97.20	0.3462	0.3567	-5.10	-2.03	-0.0498	0.7879	0.0143	0.0145	12.9348	8.7707
1.0	0.02	0.05	88.64	95.43	0.3575	0.3662	-10.29	-4.15	-0.1015	0.6484	0.0279	0.0267	24.2097	16.4483
1.0	0.02	0.10	89.18	95.66	0.3562	0.3649	-11.02	-4.42	-0.1071	0.6278	0.0296	0.0286	26.1003	17.6273
1.0	0.02	0.20	90.63	96.26	0.3536	0.3627	-11.43	-4.53	-0.1084	0.6163	0.0302	0.0293	27.3776	18.3524
1.0	0.02	0.50	92.66	97.09	0.3514	0.3617	-11.96	-4.67	-0.1102	0.6101	0.0306	0.0306	28.3955	18.9236
1.0	0.02	0.80	93.28	97.34	0.3514	0.3619	-12.11	-4.70	-0.1108	0.6098	0.0307	0.0306	28.4844	18.9869
1.0	0.02	0.80	92.77	97.14	0.3452	0.3546	-6.15	-2.44	-0.0605	0.7957	0.0157	0.0151	14.1015	9.3064
1.0	0.05	0.05	89.16	95.65	0.3532	0.3602	-11.03	-4.42	-0.1091	0.6965	0.0265	0.0239	23.1033	15.3585
1.0	0.05	0.10	89.57	96.24	0.3509	0.3585	-11.49	-4.56	-0.1108	0.6761	0.0275	0.0255	24.6283	16.2762
1.0	0.05	0.20	90.57	96.24	0.3509	0.3585	-11.49	-4.72	-0.1132	0.6650	0.0282	0.0267	25.8764	17.0232
1.0	0.05	0.50	92.53	97.04	0.3491	0.3577	-12.10	-4.76	-0.1139	0.6645	0.0283	0.0267	25.9997	17.1031
1.0	0.05	0.80	93.13	97.28	0.3490	0.3589	-12.26	-1.95	-0.0491	0.8326	0.0105	0.0092	9.5803	6.1622
1.0	0.10	0.10	95.24	98.13	0.3371	0.3455	-4.96	-3.58	-0.0897	0.8090	0.0180	0.0150	16.2003	10.4263
1.0	0.10	0.20	92.95	97.21	0.3414	0.3480	-9.11	-3.76	-0.0927	0.7921	0.0191	0.0165	17.5716	11.2939
1.0	0.10	0.50	94.91	98.00	0.3399	0.3475	-9.72	-3.81	-0.0935	0.7912	0.0192	0.0166	17.7248	11.3939
1.0	0.10	0.80	95.51	98.24	0.3399	0.3478	-9.68	-1.25	-0.0326	0.9583	0.0049	0.0034	4.5016	2.8369
1.0	0.20	0.20	93.82	99.54	0.3283	0.3364	-3.24	-2.40	-0.0619	0.9222	0.0090	0.0060	8.2763	5.2165
1.0	0.20	0.50	93.35	99.36	0.3298	0.3371	-6.27	-2.45	-0.0630	0.9210	0.0092	0.0062	8.4599	5.3333
1.0	0.20	0.80	93.95	99.59	0.3299	0.3374	-6.44	-9.35	-0.0698	0.9993	0.0005	-0.0001	0.6505	0.4095
1.0	0.50	0.50	103.79	101.41	0.3213	0.3309	-0.93	-0.68	-0.0190	0.9988	0.0009	-0.0003	1.2527	0.9417
1.0	0.50	0.80	103.58	101.37	0.3216	0.3309	-1.81	-0.10	-0.0030	1.0009	-0.0000	-0.0002	0.1879	0.1568
1.0	0.80	0.80	105.11	101.94	0.3207	0.3311	-0.28	0.03	0.0031	0.8139	0.0128	0.0131	8.1105	5.5236
0.3	0.02	0.02	35.00	65.78	0.3322	0.3426	0.03	-0.51	-0.0137	0.6772	0.0245	0.0249	17.0370	11.2783
0.3	0.02	0.05	42.04	70.93	0.3333	0.3436	-0.74	-1.69	-0.0471	0.6227	0.0284	0.0303	22.5921	14.6930
0.3	0.02	0.10	51.04	76.72	0.3303	0.3428	-2.85	-3.01	-0.0789	0.5993	0.0303	0.0329	27.0303	17.4631
0.3	0.02	0.20	64.46	84.22	0.3308	0.3457	-6.00	-4.30	-0.1034	0.6003	0.0309	0.0323	29.1203	19.0417
0.3	0.02	0.50	84.02	93.46	0.3405	0.3557	-10.32	-4.60	-0.1088	0.6053	0.0308	0.0313	28.8399	19.0682
0.3	0.02	0.80	90.34	96.14	0.3466	0.3600	-11.59	-0.04	0.0002	0.8352	0.0121	0.0120	8.5217	5.4906
0.3	0.05	0.05	42.72	71.39	0.3209	0.3307	-0.06	-1.03	-0.0297	0.7109	0.0225	0.0223	17.5734	11.1193
0.3	0.05	0.10	52.14	77.38	0.3245	0.3349	-1.75	-2.66	-0.0706	0.6603	0.0266	0.0274	23.4272	14.8635
0.3	0.05	0.20	65.14	84.57	0.3271	0.3402	-5.32	-4.26	-0.1042	0.6530	0.0285	0.0283	26.5192	17.1107
0.3	0.05	0.50	84.11	93.51	0.3381	0.3516	-10.22	-4.63	-0.1113	0.6583	0.0285	0.0274	26.3561	17.2009
0.3	0.05	0.80	90.26	96.11	0.3443	0.3561	-11.67	-0.00	0.0001	0.9053	0.0070	0.0064	5.3782	3.2731
0.3	0.10	0.10	53.89	78.41	0.3089	0.3190	-0.01	-1.45	-0.0403	0.7970	0.0160	0.0151	13.9749	8.5554
0.3	0.10	0.20	67.52	85.78	0.3165	0.3279	-2.94	-3.24	-0.0816	0.7779	0.0193	0.0176	17.9927	11.3093
0.3	0.10	0.50	86.49	94.53	0.3289	0.3410	-7.84	-3.66	-0.0904	0.7844	0.0194	0.0171	18.0253	11.4727
0.3	0.10	0.80	92.64	97.08	0.3353	0.3458	-9.29	0.02	0.0001	0.9574	0.0032	0.0025	2.5956	1.5036
0.3	0.20	0.20	70.50	87.26	0.3037	0.3153	0.05	-1.79	-0.0477	0.9055	0.0092	0.0069	8.4605	5.1470
0.3	0.20	0.50	89.94	95.97	0.3188	0.3303	-4.40	-2.27	-0.0590	0.9129	0.0094	0.0066	8.7047	5.4049
0.3	0.20	0.80	96.08	98.47	0.3253	0.3353	-5.85	0.02	0.0000	0.9898	0.0006	0.0003	0.5359	0.3049
0.3	0.50	0.50	94.40	97.79	0.3102	0.3237	0.06	-0.47	-0.0137	0.9395	0.0013	0.0001	1.2929	0.8497
0.3	0.50	0.80	100.71	100.27	0.3171	0.3238	-1.22	0.01	0.0000	0.9960	0.0002	0.0000	0.1647	0.0967
0.3	0.80	0.80	101.96	100.75	0.3161	0.3237	0.03							

Exhibit A-7 (continued)

0.0	0.02	0.02	10.18	38.20	0.2868	0.2967	2.23	4.29	0.2817	0.6363	0.0201	0.0213	7.3231	6.3368
0.0	0.02	0.05	22.08	54.14	0.2979	0.3107	3.35	3.74	0.1841	0.5647	0.0279	0.0307	15.3564	10.6763
0.0	0.02	0.10	34.70	65.54	0.3052	0.3215	0.63	0.51	0.0280	0.5650	0.0299	0.0344	22.0625	14.1602
0.0	0.02	0.20	53.24	78.04	0.3156	0.3343	-3.67	-2.11	-0.0549	0.5747	0.0308	0.0354	27.3559	17.3445
0.0	0.02	0.50	80.31	91.83	0.3353	0.3529	-9.61	-4.14	-0.1001	0.5943	0.0311	0.0332	29.4781	19.1109
0.0	0.02	0.80	89.08	95.62	0.3445	0.3592	-11.37	-4.55	-0.1080	0.6031	0.0303	0.0316	28.9976	19.1058
0.0	0.05	0.05	21.27	53.28	0.2832	0.2939	2.55	2.88	0.1367	0.7494	0.0132	0.0138	6.8444	5.0736
0.0	0.05	0.10	36.27	66.76	0.2983	0.3118	2.22	1.72	0.0697	0.6459	0.0229	0.0247	16.2243	10.2935
0.0	0.05	0.20	54.24	78.62	0.3116	0.3282	-2.67	-1.53	-0.0400	0.6325	0.0263	0.0293	23.4105	14.5735
0.0	0.05	0.50	80.50	91.92	0.3328	0.3487	-9.42	-4.05	-0.0997	0.6457	0.0286	0.0290	26.8501	17.1725
0.0	0.05	0.80	89.03	95.60	0.3423	0.3553	-11.42	-4.58	-0.1102	0.6560	0.0285	0.0277	26.5152	17.2432
0.0	0.10	0.10	36.16	66.67	0.2818	0.2935	2.11	1.64	0.0617	0.8579	0.0065	0.0065	4.1948	2.9182
0.0	0.10	0.20	56.62	79.98	0.3007	0.3151	-0.29	-0.16	-0.0027	0.7653	0.0159	0.0162	13.5613	8.1886
0.0	0.10	0.50	82.83	92.97	0.3236	0.3379	-7.04	-3.00	-0.0761	0.7602	0.0194	0.0182	18.2348	11.3536
0.0	0.10	0.80	91.41	96.58	0.3332	0.3449	-9.04	-3.59	-0.0890	0.7810	0.0193	0.0173	18.1614	11.5146
0.0	0.20	0.20	58.37	80.96	0.2877	0.3015	1.46	0.81	0.0249	0.9392	0.0030	0.0026	2.2323	1.4744
0.0	0.20	0.50	86.33	94.46	0.3136	0.3271	-3.59	-1.51	-0.0407	0.8952	0.0094	0.0074	8.6356	5.1733
0.0	0.20	0.80	94.85	97.98	0.3232	0.3343	-5.59	-2.20	-0.0572	0.9033	0.0095	0.0068	8.8200	5.4420
0.0	0.50	0.50	90.41	96.17	0.3050	0.3202	0.49	0.20	0.0049	0.9833	0.0008	0.0005	0.6462	0.4052
0.0	0.50	0.80	99.48	99.80	0.3152	0.3278	-0.96	-0.37	-0.0113	0.9849	0.0014	0.0002	1.3655	0.8468
0.0	0.80	0.80	100.61	100.24	0.3140	0.3277	0.17	0.06	0.0014	0.9935	0.0003	0.0001	0.2393	0.1465

Exhibit A-7 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	88.32	95.30	0.3481	0.3583	-6.26	-2.57	-0.0641	0.7855	0.0146	0.0147	12.9536	8.9008
1.0	0.02	0.05	78.69	91.10	0.3621	0.3696	-12.14	-5.24	-0.1317	0.6415	0.0291	0.0275	23.8680	16.6770
1.0	0.02	0.10	73.70	88.79	0.3618	0.3681	-11.76	-5.29	-0.1357	0.6303	0.0303	0.0287	24.4147	17.0261
1.0	0.02	0.20	67.04	85.54	0.3579	0.3632	-10.34	-4.97	-0.1312	0.6266	0.0302	0.0293	24.2035	16.7381
1.0	0.02	0.50	57.15	80.28	0.3460	0.3528	-8.33	-4.46	-0.1228	0.6199	0.0303	0.0314	24.6990	16.6932
1.0	0.02	0.80	53.87	78.49	0.3389	0.3485	-7.71	-4.30	-0.1195	0.6169	0.0304	0.0325	25.1553	16.8069
1.0	0.05	0.05	83.34	93.17	0.3497	0.3581	-7.49	-3.17	-0.0809	0.7863	0.0168	0.0160	14.3617	9.8318
1.0	0.05	0.10	73.01	88.46	0.3600	0.3644	-12.45	-5.62	-0.1455	0.6930	0.0284	0.0250	22.5937	15.5928
1.0	0.05	0.20	66.55	85.29	0.3557	0.3592	-10.83	-5.22	-0.1394	0.6875	0.0280	0.0254	22.1233	15.1352
1.0	0.05	0.50	56.93	80.16	0.3434	0.3485	-8.55	-4.59	-0.1279	0.6784	0.0278	0.0271	22.3538	14.9416
1.0	0.05	0.80	53.73	78.32	0.3363	0.3441	-7.85	-4.38	-0.1235	0.6733	0.0279	0.0281	22.7826	15.0514
1.0	0.10	0.10	79.39	91.42	0.3435	0.3498	-6.07	-2.67	-0.0708	0.8751	0.0120	0.0104	10.0636	6.7752
1.0	0.10	0.20	68.00	86.02	0.3468	0.3491	-9.38	-4.48	-0.1226	0.8209	0.0191	0.0152	15.2002	10.2121
1.0	0.10	0.50	58.39	80.97	0.3341	0.3377	-7.09	-3.77	-0.1081	0.8092	0.0185	0.0163	14.9353	9.8193
1.0	0.10	0.80	55.19	79.17	0.3270	0.3331	-6.39	-3.54	-0.1025	0.8029	0.0185	0.0171	15.3038	9.9906
1.0	0.20	0.20	73.37	88.64	0.3335	0.3377	-4.01	-1.87	-0.0530	0.9632	0.0059	0.0038	4.8773	3.2783
1.0	0.20	0.50	60.49	82.12	0.3238	0.3267	-4.99	-2.63	-0.0735	0.9428	0.0032	0.0053	6.8544	4.5374
1.0	0.20	0.80	57.29	80.36	0.3168	0.3220	-4.29	-2.35	-0.0711	0.9350	0.0034	0.0060	7.0233	4.5250
1.0	0.50	0.50	64.29	84.13	0.3158	0.3207	-1.19	-0.61	-0.0194	1.0101	0.0002	-0.0007	0.8136	0.7403
1.0	0.50	0.80	60.11	81.91	0.3087	0.3151	-1.47	-0.79	-0.0257	1.0126	0.0003	-0.0009	1.0736	0.9673
1.0	0.80	0.80	61.21	82.51	0.3081	0.3155	-0.37	-0.20	-0.0064	1.0074	-0.0003	-0.0005	0.3533	0.2963
1.0	0.80	0.80	61.21	82.51	0.3081	0.3155	-0.37	-0.20	-0.0064	1.0074	-0.0003	-0.0005	0.3533	0.2963
0.3	0.02	0.02	39.41	62.04	0.3354	0.3449	-1.12	-0.95	-0.0338	0.8265	0.0125	0.0129	7.6149	5.3307
0.3	0.02	0.05	32.09	63.45	0.3362	0.3444	-2.59	-2.08	-0.0719	0.7044	0.0240	0.0242	15.3214	10.4544
0.3	0.02	0.10	35.57	66.22	0.3309	0.3396	-3.59	-2.67	-0.0853	0.6490	0.0274	0.0295	19.5732	13.1175
0.3	0.02	0.20	40.87	70.11	0.3252	0.3372	-4.90	-3.31	-0.0997	0.6173	0.0294	0.0331	23.3622	15.4186
0.3	0.02	0.50	48.51	75.17	0.3270	0.3416	-6.68	-4.30	-0.1132	0.6075	0.0303	0.0341	25.6974	16.8576
0.3	0.02	0.80	50.93	76.66	0.3303	0.3447	-7.19	-4.17	-0.1165	0.6091	0.0304	0.0336	25.6854	16.9285
0.3	0.05	0.05	33.29	64.42	0.3243	0.3321	-1.40	-1.11	-0.0390	0.8530	0.0121	0.0119	7.9443	5.2833
0.3	0.05	0.10	35.99	66.54	0.3245	0.3317	-3.17	-2.35	-0.0785	0.7426	0.0218	0.0216	15.3528	10.0314
0.3	0.05	0.20	41.12	70.28	0.3214	0.3314	-4.66	-3.14	-0.0966	0.6838	0.0256	0.0272	20.1373	13.0776
0.3	0.05	0.50	48.51	75.17	0.3244	0.3371	-6.67	-4.00	-0.1150	0.6629	0.0277	0.0295	23.1810	15.0559
0.3	0.05	0.80	50.86	76.62	0.3278	0.3403	-7.26	-4.21	-0.1195	0.6646	0.0279	0.0292	23.2720	15.1845
0.3	0.10	0.10	38.04	68.08	0.3096	0.3163	-1.12	-0.82	-0.0284	0.9260	0.0069	0.0062	4.9285	3.1010
0.3	0.10	0.20	42.57	71.29	0.3109	0.3186	-3.20	-2.13	-0.0685	0.8249	0.0151	0.0144	11.8711	7.4722
0.3	0.10	0.50	49.97	76.07	0.3151	0.3256	-5.22	-3.10	-0.0913	0.7906	0.0184	0.0181	15.5061	9.8390
0.3	0.10	0.80	52.32	77.49	0.3186	0.3291	-5.80	-3.33	-0.0974	0.7921	0.0187	0.0179	15.7152	10.0252
0.3	0.20	0.20	45.06	72.95	0.2987	0.3062	-0.72	-0.47	-0.0164	0.9737	0.0029	0.0020	2.1350	1.3154
0.3	0.20	0.50	52.07	77.34	0.3051	0.3142	-3.12	-1.82	-0.0569	0.9203	0.0084	0.0066	7.0310	4.3538
0.3	0.20	0.80	54.42	78.73	0.3086	0.3178	-3.70	-2.10	-0.0644	0.9218	0.0087	0.0067	7.3629	4.6163
0.3	0.50	0.50	54.99	79.06	0.2971	0.3076	-0.19	-0.11	-0.0042	0.9970	0.0004	-0.0000	0.3311	0.2243
0.3	0.50	0.80	57.24	80.33	0.3008	0.3109	-0.88	-0.49	-0.0167	0.9969	0.0009	-0.0002	0.9648	0.7176
0.3	0.80	0.80	58.06	80.79	0.2999	0.3110	-0.05	-0.03	-0.0012	0.9991	0.0001	-0.0001	0.0853	0.0670

Exhibit A-7 (continued)

0.0	0.02	0.02	5.59	28.39	0.2692	0.2749	1.08	3.05	0.2309	0.6599	0.0177	0.0203	4.8331	4.6057
0.0	0.02	0.05	12.13	41.46	0.2798	0.2893	1.50	2.47	0.1471	0.5845	0.0252	0.0302	11.6763	8.5771
0.0	0.02	0.10	19.23	50.99	0.2873	0.3014	-0.09	-0.10	0.0068	0.5775	0.0277	0.0349	18.3341	12.2170
0.0	0.02	0.20	29.66	61.39	0.2977	0.3154	-2.57	-2.17	-0.0676	0.5818	0.0293	0.0367	23.6781	15.3139
0.0	0.02	0.50	44.80	72.79	0.3172	0.3358	-5.97	-3.78	-0.1081	0.5975	0.0303	0.0354	26.1267	16.9777
0.0	0.02	0.80	49.67	75.89	0.3263	0.3430	-6.97	-4.11	-0.1152	0.6052	0.0304	0.0341	25.8505	16.9854
0.0	0.05	0.05	11.04	41.00	0.2661	0.2725	1.21	2.01	0.1145	0.7684	0.0115	0.0131	4.8183	3.8096
0.0	0.05	0.10	20.12	52.01	0.2804	0.2910	0.81	0.92	0.0478	0.6626	0.0203	0.0245	12.9675	8.5313
0.0	0.05	0.20	30.22	61.87	0.2936	0.3088	-2.01	-1.69	-0.0531	0.6421	0.0252	0.0301	20.0156	12.7274
0.0	0.05	0.50	44.91	72.85	0.3146	0.3312	-5.87	-3.71	-0.1080	0.6504	0.0277	0.0308	23.6409	15.1662
0.0	0.05	0.80	49.64	75.87	0.3239	0.3386	-7.00	-4.13	-0.1176	0.6596	0.0279	0.0297	23.4910	15.2675
0.0	0.10	0.10	20.32	52.23	0.2652	0.2726	1.00	1.14	0.0517	0.8303	0.0056	0.0061	2.9712	2.1502
0.0	0.10	0.20	31.68	63.10	0.2830	0.2949	-0.56	-0.46	-0.0134	0.7770	0.0146	0.0162	11.2291	6.9817
0.0	0.10	0.50	46.36	73.89	0.3054	0.3195	-4.42	-2.76	-0.0829	0.7754	0.0183	0.0190	15.8554	9.9023
0.0	0.10	0.80	51.09	76.75	0.3148	0.3272	-5.55	-3.24	-0.0951	0.7860	0.0183	0.0183	15.9065	10.0873
0.0	0.20	0.20	32.92	64.13	0.2710	0.2811	0.69	0.56	0.0208	0.9458	0.0026	0.0025	1.5752	1.0641
0.0	0.20	0.50	48.46	75.14	0.2956	0.3089	-2.31	-1.43	-0.0453	0.9018	0.0087	0.0075	7.2393	4.4055
0.0	0.20	0.80	53.19	78.01	0.3049	0.3159	-3.44	-1.99	-0.0613	0.9143	0.0089	0.0070	7.5315	4.6702
0.0	0.50	0.50	51.01	76.70	0.2876	0.3009	0.23	0.14	0.0041	0.9853	0.0007	0.0005	0.4462	0.2831
0.0	0.50	0.80	56.01	79.64	0.2972	0.3091	-0.63	-0.36	-0.0125	0.9831	0.0012	0.0002	1.0502	0.6858
0.0	0.80	0.80	56.72	80.04	0.2962	0.3090	0.03	0.04	0.0011	0.9944	0.0002	0.0001	0.1633	0.1014

Exhibit A-7 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0
THETA = 135.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	83.56	95.40	0.3473	0.3576	-6.35	-2.60	-0.0644	0.7873	0.0145	0.0147	12.9710	8.9025
1.0	0.02	0.05	79.21	91.34	0.3602	0.3680	-12.39	-5.32	-0.1323	0.6463	0.0283	0.0275	23.9629	16.6744
1.0	0.02	0.10	74.71	89.27	0.3538	0.3657	-12.15	-5.42	-0.1367	0.6325	0.0291	0.0289	24.8759	17.2252
1.0	0.02	0.20	68.78	86.41	0.3535	0.3601	-10.92	-5.15	-0.1330	0.6250	0.0302	0.0300	25.1527	17.2164
1.0	0.02	0.50	59.92	81.81	0.3406	0.3499	-9.17	-4.75	-0.1262	0.6162	0.0303	0.0323	26.0359	17.4020
1.0	0.02	0.80	56.95	80.17	0.3338	0.3461	-8.62	-4.62	-0.1237	0.6147	0.0303	0.0332	26.4894	17.5230
1.0	0.05	0.05	83.98	93.45	0.3478	0.3563	-7.62	-3.21	-0.0810	0.7919	0.0164	0.0153	14.2351	9.7806
1.0	0.05	0.10	74.08	88.97	0.3565	0.3615	-12.78	-5.71	-0.1456	0.7001	0.0278	0.0243	22.6603	15.5223
1.0	0.05	0.20	68.31	86.13	0.3510	0.3558	-11.38	-5.38	-0.1405	0.6892	0.0277	0.0257	22.7700	15.4200
1.0	0.05	0.50	59.70	81.69	0.3383	0.3454	-9.39	-4.87	-0.1312	0.6777	0.0276	0.0273	23.4985	15.5414
1.0	0.05	0.80	56.80	80.09	0.3312	0.3416	-8.77	-4.70	-0.1277	0.6760	0.0277	0.0287	23.9436	15.6702
1.0	0.10	0.10	80.68	92.09	0.3402	0.3467	-6.17	-2.68	-0.0703	0.8221	0.0114	0.0109	9.8563	6.5975
1.0	0.10	0.20	69.95	86.99	0.3417	0.3451	-9.74	-4.57	-0.1224	0.6257	0.0184	0.0150	15.2339	10.1063
1.0	0.10	0.50	61.33	82.57	0.3285	0.3342	-7.75	-3.98	-0.1103	0.6999	0.0182	0.0166	15.6479	10.1645
1.0	0.10	0.80	58.44	81.00	0.3218	0.3302	-7.13	-3.79	-0.1058	0.6939	0.0183	0.0174	16.0969	10.2759
1.0	0.20	0.20	75.62	89.69	0.3237	0.3335	-4.08	-1.86	-0.0519	0.9675	0.0053	0.0035	4.6599	3.1312
1.0	0.20	0.50	63.70	83.82	0.3102	0.3229	-5.39	-2.73	-0.0790	0.9444	0.0079	0.0053	7.0203	4.6573
1.0	0.20	0.80	60.30	82.29	0.3116	0.3188	-4.77	-2.50	-0.0730	0.9369	0.0081	0.0060	7.3226	4.6753
1.0	0.50	0.50	67.87	85.96	0.3104	0.3169	-1.21	-0.60	-0.0185	1.0107	0.0030	-0.0007	0.7895	0.7222
1.0	0.50	0.80	63.93	83.97	0.3036	0.3119	-1.59	-0.82	-0.0256	1.0136	0.0002	-0.0010	1.0314	0.9034
1.0	0.80	0.80	65.19	84.60	0.3032	0.3124	-0.37	-0.19	-0.0060	1.0075	-0.0003	-0.0005	0.3529	0.2804
0.3	0.02	0.02	30.64	62.23	0.3334	0.3430	-1.22	-1.02	-0.0852	0.8237	0.0124	0.0129	7.6657	5.3537
0.3	0.02	0.05	32.61	63.38	0.3325	0.3413	-2.64	-2.26	-0.0743	0.7039	0.0235	0.0243	15.5583	10.5565
0.3	0.02	0.10	36.57	66.98	0.3256	0.3362	-3.98	-2.90	-0.0902	0.6569	0.0271	0.0299	20.2662	13.4602
0.3	0.02	0.20	42.61	71.31	0.3203	0.3339	-5.48	-3.59	-0.1042	0.6171	0.0291	0.0337	24.4440	15.9963
0.3	0.02	0.50	51.27	76.86	0.3222	0.3391	-7.52	-4.33	-0.1179	0.6069	0.0301	0.0347	26.9342	17.5571
0.3	0.02	0.80	54.01	78.49	0.3255	0.3425	-8.10	-4.59	-0.1212	0.6035	0.0302	0.0343	26.9369	17.6356
0.3	0.05	0.05	33.93	64.94	0.3207	0.3287	-1.53	-1.19	-0.0402	0.8589	0.0117	0.0117	7.9105	5.2974
0.3	0.05	0.10	37.05	67.34	0.3196	0.3277	-3.50	-2.54	-0.0814	0.7471	0.0211	0.0214	15.6049	10.1304
0.3	0.05	0.20	42.83	71.50	0.3163	0.3278	-5.21	-3.40	-0.1007	0.6854	0.0251	0.0275	20.9301	13.4903
0.3	0.05	0.50	51.28	76.87	0.3195	0.3344	-7.51	-4.33	-0.1197	0.6635	0.0274	0.0300	24.2863	15.6476
0.3	0.05	0.80	53.93	78.44	0.3230	0.3379	-8.17	-4.54	-0.1242	0.6650	0.0276	0.0297	24.3955	15.7904
0.3	0.10	0.10	39.33	69.02	0.3049	0.3121	-1.22	-0.87	-0.0289	0.9305	0.0064	0.0059	4.8947	3.0033
0.3	0.10	0.20	44.52	72.60	0.3057	0.3146	-3.57	-2.30	-0.0703	0.8235	0.0145	0.0143	12.1243	7.5918
0.3	0.10	0.50	52.91	77.84	0.3101	0.3226	-5.88	-3.35	-0.0954	0.7926	0.0169	0.0182	16.1523	10.1036
0.3	0.10	0.80	55.57	79.39	0.3137	0.3263	-6.54	-3.60	-0.1012	0.7940	0.0164	0.0181	16.3917	10.3903
0.3	0.20	0.20	47.30	74.41	0.2937	0.3021	-0.79	-0.50	-0.0164	0.9764	0.0026	0.0018	2.0697	1.2477
0.3	0.20	0.50	55.28	79.22	0.3001	0.3109	-3.51	-1.97	-0.0590	0.9250	0.0069	0.0066	7.2215	4.4692
0.3	0.20	0.80	57.94	80.72	0.3038	0.3148	-4.17	-2.27	-0.0669	0.9246	0.0084	0.0066	7.5955	4.7553
0.3	0.50	0.50	58.57	81.07	0.2924	0.3043	-0.22	-0.12	-0.0041	0.9978	0.0003	-0.0000	0.2944	0.2031
0.3	0.50	0.80	61.11	82.46	0.2961	0.3079	-1.00	-0.53	-0.0173	0.9936	0.0023	-0.0002	0.9557	0.7336
0.3	0.80	0.80	62.05	82.95	0.2954	0.3081	-0.06	-0.03	-0.0012	0.9995	0.0003	-0.0001	0.0763	0.0627

Exhibit A-7 (continued)

0.0	0.02	0.02	5.82	29.00	0.2645	0.2711	0.98	2.68	0.2101	0.6727	0.0164	0.0196	4.7301	4.4766
0.0	0.02	0.05	12.65	42.27	0.2750	0.2858	1.25	1.98	0.1223	0.5953	0.0233	0.0296	11.9079	8.5057
0.0	0.02	0.10	20.23	52.13	0.2827	0.2982	-0.48	-0.53	-0.0074	0.5838	0.0267	0.0347	19.0714	12.5935
0.0	0.02	0.20	31.39	62.87	0.2932	0.3126	-3.16	-2.56	-0.0761	0.5349	0.0286	0.0369	24.7358	15.8933
0.0	0.02	0.50	47.57	74.57	0.3126	0.3335	-6.81	-4.13	-0.1134	0.5980	0.0299	0.0359	27.3915	17.6663
0.0	0.02	0.80	52.75	77.75	0.3218	0.3408	-7.88	-4.45	-0.1200	0.6050	0.0301	0.0347	27.1389	17.6871
0.0	0.05	0.05	12.48	42.02	0.2617	0.2688	1.08	1.73	0.0996	0.7793	0.0106	0.0126	4.7462	3.6633
0.0	0.05	0.10	21.19	53.19	0.2757	0.2875	0.48	0.52	0.0331	0.6721	0.0197	0.0240	13.2609	8.6351
0.0	0.05	0.20	31.99	63.36	0.2890	0.3057	-2.56	-2.06	-0.0618	0.6470	0.0244	0.0301	20.8002	13.1508
0.0	0.05	0.50	47.67	74.64	0.3100	0.3287	-6.71	-4.06	-0.1135	0.6522	0.0273	0.0311	24.7150	15.7466
0.0	0.05	0.80	52.70	77.72	0.3193	0.3362	-7.92	-4.47	-0.1226	0.6605	0.0276	0.0302	24.5969	15.8471
0.0	0.10	0.10	21.61	53.64	0.2611	0.2692	0.90	0.98	0.0450	0.8876	0.0051	0.0057	2.8751	2.0346
0.0	0.10	0.20	33.62	64.69	0.2785	0.2916	-0.92	-0.73	-0.0206	0.7338	0.0139	0.0159	11.5035	7.0665
0.0	0.10	0.50	49.31	75.66	0.3008	0.3167	-5.07	-3.04	-0.0874	0.7787	0.0189	0.0191	16.4790	10.2575
0.0	0.10	0.80	54.34	78.68	0.3101	0.3245	-6.28	-3.51	-0.0991	0.7834	0.0184	0.0183	16.5693	10.4460
0.0	0.20	0.20	35.17	65.91	0.2669	0.2779	0.62	0.49	0.0181	0.9499	0.0023	0.0023	1.4372	0.9850
0.0	0.20	0.50	51.67	77.10	0.2911	0.3049	-2.71	-1.60	-0.0483	0.9053	0.0083	0.0074	7.4684	4.5091
0.0	0.20	0.80	56.71	80.03	0.3003	0.3130	-3.92	-2.16	-0.0641	0.9176	0.0086	0.0069	7.7541	4.8031
0.0	0.50	0.50	54.59	78.82	0.2833	0.2980	0.21	0.12	0.0035	0.9872	0.0006	0.0004	0.4032	0.2526
0.0	0.50	0.80	59.88	81.79	0.2928	0.3062	-0.74	-0.40	-0.0134	0.9901	0.0011	0.0001	1.0258	0.6911
0.0	0.80	0.80	60.70	82.23	0.2919	0.3062	0.07	0.04	0.0010	0.9949	0.0002	0.0001	0.1448	0.0892

Exhibit A-7 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	20.	0.00	169.5	8.40	78.79	91.15	0.3839	0.3851	-26.37	-10.81	-0.2541	0.3874	0.0644	0.0539	51.8051	35.497
	20.	0.02	168.3	9.05	80.97	92.13	0.3728	0.3737	-24.22	-9.84	-0.2349	0.4933	0.0532	0.0425	43.6619	29.161
	20.	0.05	166.7	9.90	83.92	93.42	0.3602	0.3612	-21.33	-8.57	-0.2089	0.6195	0.0405	0.0300	34.0741	22.188
	20.	0.10	164.5	11.08	88.05	95.19	0.3463	0.3481	-17.27	-6.83	-0.1717	0.7652	0.0265	0.0167	22.9667	14.674
	20.	0.20	161.4	12.74	94.07	97.66	0.3320	0.3358	-11.37	-4.40	-0.1160	0.9136	0.0118	0.0044	11.0772	7.250
	20.	0.50	157.3	14.96	102.28	100.88	0.3214	0.3300	-3.34	-1.26	-0.0359	1.0007	0.0008	-0.0015	2.1613	1.785
	20.	0.80	163.1	11.82	104.68	101.78	0.3205	0.3307	-1.02	-0.33	-0.0111	1.0031	-0.0002	-0.0003	0.7298	0.602
	40.	0.00	160.4	13.31	69.79	86.90	0.3936	0.3816	-35.54	-15.12	-0.3559	0.3708	0.0737	0.0503	55.7385	37.786
	40.	0.02	156.5	15.40	72.67	88.30	0.3795	0.3692	-32.69	-13.73	-0.3291	0.4325	0.0595	0.0378	46.5429	30.841
	40.	0.05	151.5	18.10	76.55	90.12	0.3641	0.3561	-28.84	-11.92	-0.2926	0.6152	0.0440	0.0247	35.9826	23.435
	40.	0.10	144.8	21.73	82.01	92.59	0.3477	0.3439	-23.44	-9.48	-0.2405	0.7675	0.0275	0.0116	24.1250	15.694
	40.	0.20	135.6	26.73	89.99	96.09	0.3316	0.3320	-15.53	-6.10	-0.1626	0.9210	0.0113	0.0005	11.9594	8.556
	40.	0.50	129.2	30.14	101.01	100.39	0.3208	0.3287	-4.65	-1.76	-0.0503	1.0063	0.0001	-0.0023	2.9591	2.522
	40.	0.80	163.2	11.78	104.27	101.63	0.3202	0.3303	-1.44	-0.54	-0.0155	1.0059	-0.0006	-0.0012	1.0889	0.864
	60.	0.00	133.2	25.30	66.65	85.34	0.3926	0.3776	-38.80	-16.73	-0.3921	0.3762	0.0724	0.0462	54.3950	36.900
	60.	0.02	131.5	28.94	69.76	86.89	0.3780	0.3654	-35.71	-15.18	-0.3626	0.4394	0.0578	0.0339	45.2161	30.152
	60.	0.05	122.8	33.62	73.95	88.91	0.3624	0.3527	-31.54	-13.17	-0.3224	0.6235	0.0421	0.0212	34.7829	23.067
	60.	0.10	111.3	39.85	79.86	91.63	0.3460	0.3402	-25.67	-10.47	-0.2651	0.7769	0.0257	0.0063	23.3554	15.398
	60.	0.20	96.5	47.81	88.51	95.38	0.3303	0.3302	-17.07	-6.74	-0.1792	0.9293	0.0093	-0.0013	11.6703	8.051
	60.	0.50	129.4	30.04	100.52	100.20	0.3202	0.3281	-5.16	-1.95	-0.0554	1.0110	-0.0005	-0.0034	3.2835	2.772
	60.	0.80	163.2	11.77	104.10	101.56	0.3200	0.3301	-1.61	-0.60	-0.0171	1.0031	-0.0009	-0.0014	1.2421	0.967
	80.	0.00	78.1	57.77	65.65	84.83	0.3911	0.3765	-39.89	-17.27	-0.4022	0.3308	0.0707	0.0451	53.2545	36.309
	80.	0.02	79.0	57.29	68.83	86.43	0.3766	0.3643	-36.72	-15.67	-0.3719	0.4952	0.0562	0.0323	44.1461	29.677
	80.	0.05	81.0	56.22	73.11	88.51	0.3610	0.3517	-32.45	-13.60	-0.3307	0.6303	0.0406	0.0202	33.8359	22.714
	80.	0.10	85.4	53.81	79.16	91.31	0.3449	0.3394	-26.44	-10.81	-0.2719	0.7843	0.0244	0.0063	22.5009	15.601
	80.	0.20	96.8	47.67	88.02	95.18	0.3295	0.3297	-17.61	-6.96	-0.1838	0.9367	0.0089	-0.0013	11.3072	8.033
	80.	0.50	129.5	30.02	100.35	100.14	0.3199	0.3280	-5.34	-2.02	-0.0563	1.0146	-0.0009	-0.0035	3.3140	2.835
	80.	0.80	163.2	11.76	104.04	101.54	0.3199	0.3301	-1.68	-0.63	-0.0176	1.0098	-0.0010	-0.0014	1.3022	1.003
	90.	0.00	78.2	57.73	65.51	84.76	0.3907	0.3764	-40.06	-17.35	-0.4032	0.3325	0.0702	0.0450	52.9821	36.209
	90.	0.02	79.1	57.26	68.70	86.37	0.3762	0.3642	-36.88	-15.75	-0.3728	0.4972	0.0557	0.0327	43.8963	29.571
	90.	0.05	81.0	56.20	73.00	88.46	0.3608	0.3516	-32.59	-13.66	-0.3315	0.6327	0.0402	0.0201	33.6064	22.627
	90.	0.10	85.5	53.80	79.06	91.27	0.3446	0.3394	-26.56	-10.86	-0.2726	0.7869	0.0241	0.0059	22.3146	15.538
	90.	0.20	96.8	47.66	87.95	95.15	0.3293	0.3296	-17.69	-7.00	-0.1843	0.9392	0.0086	-0.0019	11.2003	8.006
	90.	0.50	129.5	30.01	100.33	100.13	0.3199	0.3280	-5.38	-2.04	-0.0570	1.0158	-0.0010	-0.0035	3.3205	2.849
	90.	0.80	163.2	11.76	104.03	101.54	0.3199	0.3301	-1.69	-0.63	-0.0176	1.0104	-0.0010	-0.0014	1.3219	1.009
	95.	0.00	78.2	57.72	65.49	84.75	0.3906	0.3764	-40.09	-17.37	-0.4033	0.3331	0.0701	0.0450	52.9155	36.181
	95.	0.02	79.1	57.25	68.68	86.36	0.3762	0.3642	-36.91	-15.76	-0.3729	0.4979	0.0556	0.0327	43.8275	29.546
	95.	0.05	81.0	56.20	72.98	88.45	0.3607	0.3516	-32.62	-13.68	-0.3316	0.6336	0.0401	0.0201	33.5495	22.605
	95.	0.10	85.5	53.79	79.04	91.26	0.3446	0.3394	-26.58	-10.87	-0.2727	0.7879	0.0240	0.0059	22.2673	15.521
	95.	0.20	96.8	47.66	87.94	95.14	0.3293	0.3296	-17.71	-7.00	-0.1844	0.9401	0.0086	-0.0019	11.1713	8.797
	95.	0.50	129.5	30.01	100.32	100.12	0.3198	0.3280	-5.38	-2.04	-0.0570	1.0163	-0.0010	-0.0035	3.3210	2.860
	95.	0.80	163.2	11.76	104.03	101.54	0.3199	0.3301	-1.69	-0.63	-0.0176	1.0107	-0.0010	-0.0014	1.3248	1.010

Exhibit A-7 (continued)

98.	0.00	78.2	57.72	65.49	84.75	0.3906	0.3764	-40.10	-17.37	-0.4033	0.3834	0.0701	0.0449	52.6950	36.173
98.	0.02	79.1	57.25	68.68	86.36	0.3762	0.3642	-36.92	-15.77	-0.3730	0.4033	0.0556	0.0327	43.6092	29.533
98.	0.05	81.0	56.20	72.98	88.45	0.3607	0.3516	-32.63	-13.68	-0.3316	0.6340	0.0401	0.0201	33.5318	22.598
98.	0.10	85.5	53.79	79.04	91.26	0.3446	0.3394	-26.59	-10.87	-0.2727	0.7834	0.0240	0.0079	22.2525	15.516
98.	0.20	96.8	47.66	87.94	95.14	0.3293	0.3296	-17.72	-7.01	-0.1344	0.9405	0.0036	-0.0019	11.1613	8.794
98.	0.50	129.5	30.01	100.32	100.12	0.3198	0.3280	-5.39	-2.04	-0.0570	1.0165	-0.0010	-0.0035	3.3211	2.661
98.	0.80	163.2	11.76	104.03	101.54	0.3199	0.3301	-1.70	-0.63	-0.0176	1.0103	-0.0010	-0.0014	1.3257	1.010
99.	0.00	78.2	57.72	65.49	84.75	0.3906	0.3764	-40.10	-17.37	-0.4033	0.3835	0.0701	0.0449	52.6904	36.171
99.	0.02	79.1	57.25	68.68	86.36	0.3762	0.3642	-36.92	-15.77	-0.3730	0.4034	0.0556	0.0327	43.6037	29.537
99.	0.05	81.0	56.19	72.98	88.45	0.3607	0.3516	-32.64	-13.68	-0.3317	0.6341	0.0401	0.0201	33.5277	22.597
99.	0.10	85.5	53.79	79.04	91.26	0.3446	0.3394	-26.59	-10.87	-0.2727	0.7835	0.0240	0.0079	22.2489	15.515
99.	0.20	96.8	47.66	87.94	95.14	0.3293	0.3296	-17.72	-7.01	-0.1344	0.9406	0.0036	-0.0019	11.1597	8.793
99.	0.50	129.5	30.01	100.32	100.12	0.3198	0.3280	-5.39	-2.04	-0.0570	1.0166	-0.0010	-0.0035	3.3212	2.660
99.	0.80	163.2	11.76	104.03	101.54	0.3199	0.3301	-1.70	-0.63	-0.0176	1.0103	-0.0010	-0.0014	1.3260	1.010

Exhibit A-7 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.																
	20.	0.00	170.6	7.76	43.24	71.74	0.3666	0.3725	-16.26	-9.84	-0.2726	0.3920	0.0645	0.0592	45.6433	31.296
	20.	0.02	169.3	8.47	44.57	72.63	0.3547	0.3593	-14.93	-8.95	-0.2521	0.5013	0.0525	0.0461	38.3268	25.555
	20.	0.05	167.6	9.41	46.36	73.89	0.3415	0.3452	-13.14	-7.73	-0.2242	0.6393	0.0393	0.0320	29.5933	19.239
	20.	0.10	165.2	10.68	48.86	75.39	0.3273	0.3306	-10.64	-6.20	-0.1844	0.7792	0.0250	0.0174	19.6033	12.609
	20.	0.20	161.9	12.49	52.51	77.61	0.3131	0.3174	-7.00	-3.93	-0.1247	0.9220	0.0107	0.0042	9.1441	6.160
	20.	0.50	157.5	14.89	57.48	80.46	0.3031	0.3114	-2.06	-1.14	-0.0386	1.0036	0.0004	-0.0018	1.7894	1.566
	20.	0.80	163.2	11.81	58.91	81.26	0.3024	0.3123	-0.63	-0.34	-0.0119	1.0069	-0.0004	-0.0009	0.6526	0.541
	40.	0.00	164.3	11.17	37.60	67.75	0.3751	0.3682	-21.90	-13.83	-0.3823	0.3825	0.0723	0.0549	48.4140	32.992
	40.	0.02	160.0	13.50	39.36	69.04	0.3600	0.3537	-20.14	-12.55	-0.3535	0.4097	0.0576	0.0405	40.0937	26.660
	40.	0.05	154.5	16.50	41.74	70.72	0.3440	0.3389	-17.77	-10.67	-0.3144	0.6377	0.0416	0.0257	30.4903	20.131
	40.	0.10	147.1	20.50	45.08	72.97	0.3275	0.3245	-14.44	-8.62	-0.2586	0.7941	0.0250	0.0113	20.0196	13.432
	40.	0.20	137.0	25.97	49.96	76.06	0.3119	0.3129	-9.57	-5.53	-0.1749	0.9470	0.0094	-0.0003	9.6397	7.231
	40.	0.50	129.4	30.07	56.68	80.01	0.3021	0.3099	-2.86	-1.59	-0.0541	1.0202	-0.0006	-0.0033	2.5505	2.245
	40.	0.80	163.2	11.77	58.66	81.12	0.3019	0.3118	-0.89	-0.49	-0.0167	1.0125	-0.0003	-0.0014	0.9376	0.782
	60.	0.00	145.2	21.50	35.61	66.25	0.3729	0.3632	-23.91	-15.35	-0.4215	0.3942	0.0704	0.0500	46.8357	31.973
	60.	0.02	137.7	25.59	37.51	67.69	0.3575	0.3490	-22.00	-13.90	-0.3898	0.5144	0.0550	0.0353	33.4070	25.941
	60.	0.05	128.0	30.83	40.09	69.56	0.3414	0.3347	-19.43	-12.04	-0.3466	0.6552	0.0389	0.0215	29.1579	19.709
	60.	0.10	115.2	37.74	43.71	72.06	0.3251	0.3212	-15.82	-9.54	-0.2851	0.8134	0.0226	0.0079	19.0961	13.443
	60.	0.20	98.0	47.05	49.01	75.48	0.3102	0.3108	-10.52	-6.12	-0.1928	0.9643	0.0075	-0.0025	9.3735	7.523
	60.	0.50	129.6	29.97	56.36	79.84	0.3015	0.3093	-3.18	-1.77	-0.0596	1.0291	-0.0013	-0.0039	2.8532	2.423
	60.	0.80	163.3	11.76	58.55	81.06	0.3017	0.3116	-1.00	-0.55	-0.0184	1.0163	-0.0011	-0.0016	1.1425	0.973
	80.	0.00	81.5	55.95	34.95	65.74	0.3707	0.3617	-24.58	-15.85	-0.4323	0.4035	0.0692	0.0485	45.7426	31.442
	80.	0.02	80.8	56.31	36.90	67.23	0.3554	0.3476	-22.62	-14.37	-0.3993	0.5259	0.0539	0.0344	32.4289	25.509
	80.	0.05	82.4	55.47	39.53	69.16	0.3395	0.3334	-19.99	-12.43	-0.3555	0.6637	0.0380	0.0202	28.2747	19.291
	80.	0.10	86.4	53.31	43.24	71.75	0.3236	0.3202	-16.28	-9.85	-0.2924	0.8231	0.0218	0.0069	18.4031	13.261
	80.	0.20	97.4	47.37	48.69	75.28	0.3091	0.3101	-10.85	-6.32	-0.1977	0.9731	0.0065	-0.0031	9.0883	7.503
	80.	0.50	129.6	29.94	56.25	79.77	0.3011	0.3091	-3.29	-1.83	-0.0612	1.0353	-0.0017	-0.0041	2.9529	2.542
	80.	0.80	163.3	11.75	58.51	81.04	0.3015	0.3116	-1.04	-0.57	-0.0189	1.0199	-0.0013	-0.0017	1.2034	0.913
	90.	0.00	80.2	56.64	34.85	65.66	0.3703	0.3616	-24.67	-15.93	-0.4333	0.4063	0.0677	0.0434	45.5035	31.349
	90.	0.02	80.9	56.27	36.81	67.16	0.3550	0.3474	-22.71	-14.43	-0.4007	0.5296	0.0524	0.0342	37.2535	25.421
	90.	0.05	82.4	55.45	39.46	69.11	0.3392	0.3333	-20.07	-12.49	-0.3564	0.6731	0.0365	0.0201	28.0309	19.319
	90.	0.10	86.4	53.29	43.18	71.79	0.3233	0.3200	-16.35	-9.90	-0.2931	0.8323	0.0206	0.0063	18.2500	13.213
	90.	0.20	97.4	47.37	48.64	75.25	0.3089	0.3100	-10.89	-6.35	-0.1982	0.9824	0.0062	-0.0032	9.0039	7.575
	90.	0.50	129.6	29.93	56.23	79.76	0.3010	0.3091	-3.31	-1.84	-0.0613	1.0379	-0.0017	-0.0041	2.9642	2.554
	90.	0.80	163.3	11.75	58.50	81.04	0.3015	0.3115	-1.04	-0.57	-0.0190	1.0209	-0.0013	-0.0017	1.2295	0.913
	95.	0.00	80.2	56.64	34.84	65.65	0.3702	0.3616	-24.69	-15.95	-0.4334	0.4075	0.0675	0.0434	45.4504	31.329
	95.	0.02	80.9	56.27	36.80	67.15	0.3549	0.3474	-22.73	-14.44	-0.4003	0.5307	0.0523	0.0342	37.2064	25.402
	95.	0.05	82.4	55.44	39.44	69.10	0.3391	0.3333	-20.09	-12.50	-0.3564	0.6744	0.0364	0.0201	28.0386	19.303
	95.	0.10	86.4	53.29	43.17	71.69	0.3232	0.3200	-16.36	-9.91	-0.2931	0.8342	0.0206	0.0068	18.2150	13.201
	95.	0.20	97.4	47.36	48.63	75.24	0.3089	0.3100	-10.90	-6.36	-0.1932	0.9837	0.0062	-0.0032	8.9987	7.569
	95.	0.50	129.6	29.93	56.23	79.76	0.3010	0.3091	-3.32	-1.84	-0.0613	1.0385	-0.0013	-0.0041	2.9658	2.554
	95.	0.80	163.3	11.75	58.50	81.03	0.3015	0.3113	-1.04	-0.57	-0.0190	1.0212	-0.0013	-0.0017	1.2330	0.919

Exhibit A-7 (continued)

98.	0.00	80.2	56.64	34.84	65.65	0.3701	0.3616	-24.69	-15.95	-0.4334	0.4973	0.0675	0.0484	45.4468	31.315
98.	0.02	89.9	56.27	36.80	67.15	0.3549	0.3474	-22.73	-14.45	-0.4003	0.5312	0.0722	0.0342	37.1954	25.298
98.	0.05	82.4	55.44	39.44	69.10	0.3391	0.3333	-20.09	-12.50	-0.3564	0.6749	0.0364	0.0201	23.0284	19.299
98.	0.10	86.4	53.29	43.17	71.69	0.3232	0.3200	-16.37	-9.91	-0.2931	0.8347	0.0205	0.0063	13.2066	13.197
98.	0.20	97.4	47.36	48.63	75.24	0.3039	0.3100	-10.91	-6.36	-0.1932	0.9362	0.0062	-0.0032	8.0833	7.566
98.	0.50	129.6	29.93	56.23	79.76	0.3010	0.3091	-3.32	-1.84	-0.0613	1.0303	-0.0018	-0.0041	2.9660	2.554
98.	0.80	163.3	11.75	58.50	81.03	0.3015	0.3113	-1.05	-0.57	-0.0190	1.0213	-0.0013	-0.0017	1.2235	0.919
99.	0.00	80.2	56.64	34.84	65.65	0.3701	0.3616	-24.69	-15.95	-0.4334	0.4979	0.0675	0.0484	45.4468	31.314
99.	0.02	89.9	56.27	36.80	67.15	0.3549	0.3474	-22.73	-14.45	-0.4003	0.5312	0.0722	0.0342	37.1935	25.297
99.	0.05	82.4	55.44	39.44	69.10	0.3391	0.3333	-20.09	-12.50	-0.3564	0.6750	0.0364	0.0201	23.0266	19.299
99.	0.10	86.4	53.29	43.17	71.69	0.3232	0.3200	-16.37	-9.91	-0.2931	0.8349	0.0205	0.0063	13.2050	13.197
99.	0.20	97.4	47.37	48.63	75.24	0.3039	0.3100	-10.91	-6.36	-0.1932	0.9363	0.0062	-0.0032	8.0825	7.566
99.	0.50	129.6	29.93	56.23	79.76	0.3010	0.3091	-3.32	-1.84	-0.0613	1.0303	-0.0018	-0.0041	2.9660	2.554
99.	0.80	163.3	11.75	58.50	81.03	0.3015	0.3113	-1.05	-0.57	-0.0190	1.0213	-0.0013	-0.0017	1.2236	0.919

Exhjbit A-7 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 100.0 THETA LENGTH RP/RV0		RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.															
20.	0.00	171.5	7.32	45.37	73.16	0.3626	0.3713	-18.53	-10.77	-0.2650	0.5920	0.0644	0.0607	43.0863	32.631
20.	0.02	170.1	8.07	46.86	74.12	0.3503	0.3577	-17.02	-9.79	-0.2607	0.5960	0.0521	0.0469	40.0441	26.556
20.	0.05	168.2	9.06	48.87	75.39	0.3368	0.3429	-14.99	-8.51	-0.2346	0.6364	0.0386	0.0322	30.7309	19.962
20.	0.10	165.7	10.41	51.69	77.12	0.3224	0.3278	-12.14	-6.78	-0.1930	0.7075	0.0242	0.0171	20.1719	13.003
20.	0.20	162.2	12.31	55.79	79.51	0.3082	0.3144	-8.00	-4.36	-0.1306	0.9371	0.0099	0.0033	9.2586	6.884
20.	0.50	157.5	14.84	61.38	82.60	0.2934	0.3003	-2.36	-1.25	-0.0403	1.0139	0.0001	-0.0021	1.8773	1.670
20.	0.80	163.2	11.80	63.00	83.46	0.2979	0.3095	-0.72	-0.33	-0.0125	1.0094	-0.0005	-0.0010	0.7245	0.583
40.	0.00	167.1	9.67	38.82	68.64	0.3701	0.3665	-25.01	-15.25	-0.4091	0.5373	0.0719	0.0553	50.3000	34.134
40.	0.02	162.5	12.17	40.81	70.07	0.3544	0.3512	-23.01	-13.82	-0.3701	0.5933	0.0562	0.0405	41.3094	27.554
40.	0.05	156.5	15.39	43.50	71.92	0.3381	0.3357	-20.31	-11.96	-0.3202	0.6513	0.0393	0.0251	31.2131	20.765
40.	0.10	148.6	19.65	47.28	74.39	0.3216	0.3210	-16.51	-9.43	-0.2708	0.8112	0.0233	0.0104	20.2587	13.693
40.	0.20	137.9	25.45	52.81	77.78	0.3063	0.3094	-10.96	-6.03	-0.1833	0.9643	0.0080	-0.0012	9.6640	7.522
40.	0.50	129.5	30.02	60.44	82.09	0.2973	0.3068	-3.29	-1.75	-0.0567	1.0294	-0.0011	-0.0037	2.7974	2.421
40.	0.80	163.2	11.76	62.70	83.30	0.2973	0.3089	-1.03	-0.54	-0.0175	1.0169	-0.0010	-0.0015	1.1155	0.867
60.	0.00	150.2	18.82	36.45	66.89	0.3668	0.3609	-27.34	-16.93	-0.4413	0.4986	0.0635	0.0503	43.2332	33.050
60.	0.02	142.0	23.24	38.61	68.50	0.3509	0.3459	-25.17	-15.37	-0.4002	0.5294	0.0526	0.0353	32.3741	26.320
60.	0.05	131.6	28.88	41.54	70.58	0.3346	0.3310	-22.24	-13.29	-0.3630	0.6756	0.0363	0.0204	29.5426	20.263
60.	0.10	117.9	36.27	45.65	73.34	0.3185	0.3172	-18.11	-10.52	-0.2935	0.8273	0.0201	0.0067	19.0918	13.551
60.	0.20	99.6	46.16	51.69	77.11	0.3041	0.3070	-12.06	-6.74	-0.2029	0.9886	0.0057	-0.0035	9.3925	7.962
60.	0.50	129.7	29.91	60.06	81.39	0.2964	0.3062	-3.66	-1.95	-0.0625	1.0414	-0.0020	-0.0043	3.1539	2.696
60.	0.80	163.3	11.75	62.57	83.23	0.2970	0.3087	-1.15	-0.61	-0.0193	1.0223	-0.0014	-0.0017	1.3049	0.970
80.	0.00	88.4	52.21	35.64	66.28	0.3639	0.3592	-28.12	-17.58	-0.4527	0.4166	0.0656	0.0487	46.9496	32.446
80.	0.02	82.2	55.59	37.87	67.95	0.3482	0.3442	-25.89	-15.91	-0.4187	0.5454	0.0493	0.0337	33.1442	26.247
80.	0.05	83.4	54.93	40.86	70.11	0.3322	0.3293	-22.89	-13.75	-0.3724	0.6944	0.0339	0.0190	28.4859	19.934
80.	0.10	87.0	52.95	45.09	72.97	0.3166	0.3161	-18.66	-10.83	-0.3063	0.8581	0.0182	0.0055	18.3215	13.606
80.	0.20	97.7	47.20	51.29	76.87	0.3028	0.3063	-12.45	-6.97	-0.2072	1.0067	0.0045	-0.0042	9.1110	7.996
80.	0.50	129.7	29.88	59.92	81.81	0.2960	0.3060	-3.80	-2.02	-0.0641	1.0501	-0.0024	-0.0045	3.2971	2.779
80.	0.80	163.3	11.75	62.52	83.20	0.2969	0.3087	-1.20	-0.63	-0.0198	1.0266	-0.0015	-0.0018	1.3695	1.014
90.	0.00	81.1	56.18	35.53	66.18	0.3633	0.3591	-28.23	-17.67	-0.4537	0.4207	0.0649	0.0486	46.6730	32.333
90.	0.02	82.2	55.55	37.76	67.87	0.3476	0.3441	-26.00	-15.98	-0.4196	0.5505	0.0492	0.0335	37.8877	26.151
90.	0.05	83.4	54.90	40.76	70.04	0.3317	0.3294	-22.99	-13.81	-0.3732	0.7003	0.0333	0.0183	28.2610	19.853
90.	0.10	87.1	52.93	45.00	72.92	0.3161	0.3159	-18.74	-10.93	-0.3069	0.8644	0.0173	0.0054	18.1403	13.647
90.	0.20	97.7	47.19	51.23	76.84	0.3026	0.3062	-12.51	-7.00	-0.2076	1.0123	0.0042	-0.0043	9.0316	7.981
90.	0.50	129.7	29.88	59.90	81.80	0.2959	0.3059	-3.82	-2.03	-0.0642	1.0528	-0.0025	-0.0045	3.3178	2.787
90.	0.80	163.3	11.74	62.51	83.20	0.2968	0.3087	-1.21	-0.64	-0.0199	1.0273	-0.0016	-0.0018	1.4059	1.021
95.	0.00	81.1	56.18	35.51	66.17	0.3631	0.3591	-28.24	-17.68	-0.4533	0.4219	0.0643	0.0485	46.6179	32.312
95.	0.02	82.2	55.55	37.74	67.85	0.3475	0.3441	-26.01	-16.00	-0.4196	0.5519	0.0491	0.0335	37.8361	26.131
95.	0.05	83.4	54.90	40.75	70.02	0.3316	0.3294	-23.00	-13.82	-0.3732	0.7020	0.0332	0.0183	28.2149	19.841
95.	0.10	87.1	52.93	44.99	72.91	0.3161	0.3159	-18.73	-10.94	-0.3069	0.8662	0.0177	0.0054	18.1113	13.635
95.	0.20	97.7	47.19	51.22	76.83	0.3025	0.3062	-12.51	-7.01	-0.2076	1.0149	0.0041	-0.0043	9.0118	7.974
95.	0.50	129.7	29.88	59.90	81.80	0.2959	0.3059	-3.82	-2.04	-0.0642	1.0536	-0.0025	-0.0045	3.3208	2.788
95.	0.80	163.3	11.74	62.51	83.20	0.2968	0.3087	-1.21	-0.64	-0.0199	1.0282	-0.0016	-0.0018	1.4091	1.022

Exhibit A-7 (continued)

98.	0.00	81.1	56.18	35.50	66.17	0.3631	0.3591	-28.25	-17.63	-0.4583	0.4222	0.0647	0.0436	66.6029	33.393
98.	0.02	82.2	55.55	37.73	67.85	0.3474	0.3441	-26.01	-16.00	-0.4196	0.5524	0.0491	0.0335	67.8260	26.173
98.	0.05	83.4	54.90	40.74	70.02	0.3316	0.3294	-23.00	-13.83	-0.3732	0.7025	0.0332	0.0183	69.2961	19.033
98.	0.10	87.1	52.93	44.99	72.91	0.3161	0.3159	-18.75	-10.94	-0.3069	0.8369	0.0177	0.0054	70.1037	15.681
98.	0.20	97.7	47.19	51.22	76.83	0.3025	0.3062	-12.52	-7.01	-0.2376	1.0145	0.0041	-0.0040	9.0271	7.953
98.	0.50	129.7	29.38	59.90	81.89	0.2959	0.3059	-3.83	-2.04	-0.0642	1.0333	-0.0025	-0.0045	9.2268	9.273
98.	0.80	163.3	11.74	62.51	83.20	0.2963	0.3067	-1.21	-0.64	-0.0199	1.0283	-0.0016	-0.0016	1.4026	1.022
99.	0.00	81.1	56.18	35.50	66.17	0.3631	0.3591	-28.24	-17.63	-0.4587	0.4223	0.0647	0.0439	66.6029	33.393
99.	0.02	82.2	55.55	37.73	67.85	0.3474	0.3441	-26.01	-16.00	-0.4196	0.5524	0.0491	0.0335	67.8260	26.173
99.	0.05	83.4	54.90	40.74	70.02	0.3316	0.3294	-23.00	-13.82	-0.3732	0.7025	0.0332	0.0183	69.2954	19.033
99.	0.10	87.1	52.93	44.99	72.91	0.3161	0.3159	-18.75	-10.94	-0.3069	0.8369	0.0177	0.0054	70.1030	15.681
99.	0.20	97.7	47.19	51.22	76.83	0.3025	0.3062	-12.52	-7.01	-0.2376	1.0145	0.0041	-0.0040	9.0264	7.953
99.	0.50	129.7	29.38	59.90	81.89	0.2959	0.3059	-3.83	-2.04	-0.0642	1.0339	-0.0025	-0.0045	9.2267	9.273
99.	0.80	163.3	11.74	62.51	83.20	0.2963	0.3067	-1.21	-0.64	-0.0199	1.0283	-0.0016	-0.0016	1.4025	1.022

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 3490.
SIGMA Z (M) = 195.
SO2-SO4 CONVERSION RATE= 0.0048 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.0336 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY PAR (UG/M3)	TICULATE (10-6 M-1)	BSPSM/BS (%)
H+2S												
INCREMENT!	0.013	0.009	0.000	69.922	0.838	0.003	0.018	0.172	-0.003	0.923	0.012	4.318
TOTAL AMB!	0.013	0.009	0.000	69.922	0.838	0.003	2.954	21.749	0.030	13.353	0.160	59.913
H+1S												
INCREMENT!	0.059	0.033	0.000	56.250	0.039	0.012	0.011	0.024	-0.022	4.153	0.052	0.629
TOTAL AMB!	0.059	0.033	0.000	56.250	0.039	0.012	2.947	5.624	0.016	17.032	0.129	46.565
H												
INCREMENT!	0.093	0.051	0.000	51.622	0.045	0.020	0.010	0.013	-0.025	6.869	0.025	0.842
TOTAL AMB!	0.093	0.051	0.000	51.633	0.045	0.020	2.946	3.613	0.013	19.733	0.214	39.338
H-1S												
INCREMENT!	0.060	0.034	0.000	55.938	0.037	0.012	0.012	0.024	-0.022	4.227	0.053	0.621
TOTAL AMB!	0.060	0.034	0.000	55.933	0.037	0.012	2.947	5.728	0.016	17.163	0.131	46.632
H-2S												
INCREMENT!	0.026	0.017	0.000	64.626	0.407	0.005	0.019	0.039	-0.015	1.833	0.023	0.892
TOTAL AMB!	0.026	0.017	0.000	64.626	0.407	0.005	2.955	12.291	0.023	14.774	0.152	56.442
0												
INCREMENT!	0.026	0.017	0.000	63.061	0.391	0.005	0.018	0.037	-0.017	1.833	0.023	2.247
TOTAL AMB!	0.026	0.017	0.000	63.061	0.391	0.005	2.954	12.290	0.021	14.774	0.152	55.446

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-7 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	30.	0.02	178.5	3.50	88.07	95.19	0.3596	0.3683	-16.84	-6.67	-0.1533	0.5496	0.0403	0.0375	35.8714	23.917
	30.	0.05	175.7	5.00	86.09	94.36	0.3606	0.3663	-18.82	-7.51	-0.1803	0.5772	0.0417	0.0352	35.8423	23.633
	30.	0.10	172.6	6.72	87.57	94.98	0.3568	0.3546	-17.34	-6.88	-0.1697	0.6995	0.0320	0.0236	27.6142	17.731
	30.	0.20	169.5	8.37	93.60	97.47	0.3334	0.3386	-11.31	-4.39	-0.1143	0.8330	0.0146	0.0075	13.1536	8.366
	30.	0.50	165.4	10.58	101.76	100.68	0.3203	0.3300	-3.15	-1.19	-0.0343	0.9907	0.0016	-0.0010	2.3717	1.804
	30.	0.80	164.2	11.23	104.10	101.56	0.3192	0.3303	-0.81	-0.30	-0.0093	0.9985	0.0003	-0.0006	0.7168	0.560
	45.	0.02	180.3	2.54	90.74	96.31	0.3543	0.3653	-14.17	-5.56	-0.1314	0.5762	0.0354	0.0343	32.1413	21.415
	45.	0.05	178.2	3.65	89.17	95.66	0.3551	0.3637	-15.74	-6.21	-0.1465	0.6020	0.0562	0.0327	32.1459	21.219
	45.	0.10	176.3	4.62	91.66	96.68	0.3443	0.3517	-13.25	-5.18	-0.1276	0.7402	0.0255	0.0206	22.7740	14.611
	45.	0.20	174.2	5.81	96.28	98.55	0.3309	0.3383	-8.63	-3.32	-0.0859	0.8983	0.0120	0.0073	10.9264	6.873
	45.	0.50	171.2	7.44	102.52	100.97	0.3203	0.3305	-2.39	-0.90	-0.0253	0.9921	0.0014	-0.0005	1.8431	1.263
	45.	0.80	170.3	7.93	104.30	101.64	0.3191	0.3307	-0.61	-0.23	-0.0072	0.9952	0.0003	-0.0004	0.5424	0.419
	60.	0.02	181.0	2.14	92.10	96.86	0.3512	0.3631	-12.81	-5.00	-0.1180	0.5963	0.0323	0.0320	29.8537	19.896
	60.	0.05	179.4	3.05	90.98	96.41	0.3513	0.3611	-13.92	-5.46	-0.1305	0.6230	0.0324	0.0301	29.3051	19.299
	60.	0.10	178.1	3.73	93.69	97.51	0.3408	0.3495	-11.21	-4.35	-0.1071	0.7666	0.0219	0.0165	19.9667	12.706
	60.	0.20	176.3	4.71	97.62	99.07	0.3293	0.3378	-7.29	-2.79	-0.0721	0.9084	0.0105	0.0063	9.6152	6.037
	60.	0.50	173.8	6.06	102.89	101.11	0.3201	0.3307	-2.02	-0.76	-0.0216	0.9930	0.0013	-0.0003	1.5769	1.150
	60.	0.80	173.0	6.47	104.39	101.67	0.3191	0.3307	-0.52	-0.19	-0.0060	0.9960	0.0002	-0.0003	0.4569	0.351
	90.	0.02	181.5	1.90	93.10	97.27	0.3468	0.3611	-11.81	-4.60	-0.1034	0.6162	0.0299	0.0301	27.9764	18.574
	90.	0.05	180.2	2.62	92.58	97.06	0.3476	0.3582	-12.33	-4.81	-0.1149	0.6585	0.0237	0.0272	26.4033	17.337
	90.	0.10	179.1	3.20	94.98	98.03	0.3384	0.3479	-9.92	-3.84	-0.0943	0.7856	0.0196	0.0169	18.0559	11.561
	90.	0.20	177.5	4.06	98.46	99.40	0.3293	0.3374	-6.45	-2.46	-0.0635	0.9153	0.0094	0.0063	8.7186	5.668
	90.	0.50	175.3	5.24	103.13	101.20	0.3299	0.3303	-1.78	-0.67	-0.0190	0.9936	0.0012	-0.0003	1.4067	1.016
	90.	0.80	174.6	5.60	104.45	101.70	0.3191	0.3303	-0.46	-0.17	-0.0053	0.9965	0.0002	-0.0003	0.4033	0.309
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.13	173.5	3.49	96.15	98.49	0.3346	0.3438	-8.75	-3.37	-0.0341	0.8365	0.0158	0.0123	14.5533	9.228
90.																
	30.	0.02	179.1	3.19	49.15	75.57	0.3421	0.3538	-10.33	-6.01	-0.1634	0.5333	0.0403	0.0406	31.8116	21.130
	30.	0.05	176.4	4.64	47.94	74.81	0.3428	0.3513	-11.55	-6.77	-0.1913	0.5832	0.0411	0.0380	31.5291	20.741
	30.	0.10	173.2	6.37	48.83	75.37	0.3326	0.3382	-10.65	-6.21	-0.1809	0.7090	0.0309	0.0250	23.9174	15.389
	30.	0.20	170.0	8.13	52.50	77.60	0.3153	0.3208	-6.99	-3.93	-0.1225	0.8945	0.0135	0.0075	11.0528	7.113
	30.	0.50	165.6	10.47	57.45	80.45	0.3029	0.3118	-2.03	-1.12	-0.0333	0.9963	0.0011	-0.0014	1.9326	1.599
	30.	0.80	164.4	11.15	58.87	81.23	0.3018	0.3124	-0.62	-0.34	-0.0123	0.9990	0.0000	-0.0003	0.6613	0.563
	45.	0.02	180.8	2.29	50.79	76.57	0.3368	0.3503	-8.69	-5.00	-0.1396	0.5790	0.0350	0.0371	28.6056	18.934
	45.	0.05	178.8	3.37	49.83	75.98	0.3375	0.3483	-9.66	-5.59	-0.1589	0.6066	0.0357	0.0353	28.4182	18.695
	45.	0.10	176.9	4.37	51.34	76.90	0.3264	0.3351	-8.15	-4.67	-0.1360	0.7472	0.0246	0.0219	19.8650	12.744
	45.	0.20	174.6	5.64	54.16	78.57	0.3130	0.3206	-5.33	-3.09	-0.0921	0.9066	0.0112	0.0074	9.2577	5.879
	45.	0.50	171.4	7.36	57.94	80.72	0.3028	0.3124	-1.54	-0.85	-0.0253	0.9980	0.0011	-0.0003	1.4822	1.127
	45.	0.80	170.4	7.87	59.02	81.32	0.3018	0.3126	-0.47	-0.26	-0.0092	0.9992	0.0001	-0.0006	0.4923	0.419

Exhibit A-7 (continued)

60.	0.02	131.4	1.93	51.62	77.03	0.3338	0.3479	-7.86	-4.59	-0.1254	0.5092	0.0320	0.0346	29.6127	17.695
60.	0.05	179.8	2.89	50.94	76.66	0.3337	0.3456	-8.55	-4.91	-0.1353	0.6020	0.0219	0.0324	25.9529	17.020
60.	0.10	178.5	3.52	52.59	77.65	0.3230	0.3323	-6.89	-3.92	-0.1142	0.7005	0.0212	0.0196	17.4662	11.163
60.	0.20	176.6	4.56	54.98	79.05	0.3116	0.3202	-4.51	-2.53	-0.0773	0.9153	0.0093	0.0069	8.1854	5.125
60.	0.50	173.9	6.00	58.18	80.86	0.3027	0.3127	-1.30	-0.73	-0.0242	0.9879	0.0010	-0.0005	1.2706	1.005
60.	0.80	173.1	6.42	59.09	81.36	0.3018	0.3127	-0.39	-0.22	-0.0077	0.9993	0.0001	-0.0005	0.4113	0.350
90.	0.02	181.9	1.70	52.24	77.44	0.3314	0.3457	-7.25	-4.13	-0.1152	0.6184	0.0296	0.0325	24.9446	16.501
90.	0.05	180.6	2.40	51.92	77.25	0.3300	0.3425	-7.57	-4.32	-0.1222	0.6622	0.0232	0.0292	23.4076	15.703
90.	0.10	179.4	3.03	53.39	78.12	0.3207	0.3311	-6.10	-3.45	-0.1005	0.7603	0.0169	0.0179	15.6208	10.434
90.	0.20	177.7	3.93	55.50	79.35	0.3106	0.3197	-3.99	-2.33	-0.0681	0.9217	0.0089	0.0065	7.4460	4.695
90.	0.50	175.4	5.19	58.34	80.94	0.3027	0.3123	-1.15	-0.63	-0.0213	0.9878	0.0009	-0.0004	1.1316	0.884
90.	0.80	174.7	5.56	59.14	81.33	0.3018	0.3123	-0.35	-0.19	-0.0066	0.9993	0.0001	-0.0004	0.3514	0.307
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE															
90.	0.13	178.8	3.33	54.10	78.54	0.3169	0.3267	-5.39	-3.04	-0.0998	0.8421	0.0151	0.0134	13.6688	8.626

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	ERATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
	30.	0.02	179.5	2.99	52.29	77.47	0.3381	0.3522	-11.70	-6.50	-0.1751	0.5540	0.0401	0.0413	33.3191	21.973
	30.	0.05	176.9	4.39	50.90	76.64	0.3387	0.3495	-13.09	-7.34	-0.1996	0.5035	0.0407	0.0386	32.9269	21.525
	30.	0.10	173.7	6.13	51.69	77.24	0.3283	0.3360	-12.11	-6.74	-0.1835	0.7141	0.0303	0.0251	24.8067	15.698
	30.	0.20	170.3	7.96	56.01	79.64	0.3109	0.3182	-7.93	-4.34	-0.1202	0.9016	0.0129	0.0072	11.2286	7.207
	30.	0.50	165.8	10.39	61.59	82.71	0.2983	0.3093	-2.41	-1.27	-0.0413	1.0042	0.0003	-0.0017	2.0207	1.389
	30.	0.80	164.5	11.10	63.18	83.55	0.2979	0.3099	-0.81	-0.42	-0.0144	1.0027	-0.0002	-0.0010	0.7369	0.664
	45.	0.02	131.1	2.13	54.16	78.57	0.3329	0.3487	-9.84	-5.41	-0.1452	0.5491	0.0343	0.0377	29.9909	19.353
	45.	0.05	179.1	3.17	53.05	77.92	0.3334	0.3467	-10.94	-6.05	-0.1644	0.6089	0.0354	0.0358	29.7216	19.410
	45.	0.10	177.2	4.20	54.75	78.91	0.3223	0.3329	-9.25	-5.06	-0.1417	0.7507	0.0242	0.0220	20.6586	13.103
	45.	0.20	174.8	5.52	57.91	80.71	0.3083	0.3182	-6.09	-3.27	-0.0964	0.9116	0.0103	0.0072	9.5028	6.056
	45.	0.50	171.5	7.31	62.17	83.02	0.2989	0.3099	-1.83	-0.96	-0.0310	1.0019	0.0003	-0.0010	1.5403	1.223
	45.	0.80	170.5	7.83	63.38	83.66	0.2980	0.3102	-0.61	-0.32	-0.0103	1.0019	-0.0001	-0.0007	0.5722	0.498
	60.	0.02	181.7	1.78	55.10	79.12	0.3299	0.3462	-8.90	-4.85	-0.1304	0.5091	0.0313	0.0352	27.9096	18.253
	60.	0.05	180.1	2.64	54.31	78.66	0.3297	0.3438	-9.68	-5.31	-0.1444	0.6831	0.0316	0.0329	27.1550	17.764
	60.	0.10	178.7	3.38	56.17	79.73	0.3189	0.3306	-7.83	-4.25	-0.1190	0.7754	0.0208	0.0197	18.1763	11.585
	60.	0.20	176.7	4.47	58.85	81.23	0.3075	0.3177	-5.14	-2.75	-0.0809	0.9194	0.0093	0.0068	8.4171	5.892
	60.	0.50	174.0	5.95	62.46	83.17	0.2988	0.3102	-1.54	-0.81	-0.0261	1.0010	0.0003	-0.0007	1.3083	1.039
	60.	0.80	173.2	6.39	63.48	83.71	0.2980	0.3103	-0.52	-0.27	-0.0091	1.0015	-0.0000	-0.0006	0.4756	0.410
	90.	0.02	182.1	1.57	55.79	79.51	0.3275	0.3439	-8.20	-4.46	-0.1197	0.6183	0.0294	0.0330	26.1627	17.173
	90.	0.05	180.8	2.26	55.42	79.30	0.3260	0.3406	-8.57	-4.67	-0.1271	0.6632	0.0280	0.0296	24.4943	15.922
	90.	0.10	179.6	2.91	57.07	80.24	0.3167	0.3289	-6.93	-3.74	-0.1048	0.7933	0.0135	0.0180	16.4718	10.435
	90.	0.20	177.9	3.83	59.45	81.55	0.3066	0.3173	-4.55	-2.42	-0.0713	0.9253	0.0035	0.0064	7.6620	4.880
	90.	0.50	175.5	5.14	62.64	83.27	0.2988	0.3104	-1.36	-0.71	-0.0229	1.0096	0.0007	-0.0006	1.1631	0.960
	90.	0.80	174.8	5.53	63.54	83.74	0.2980	0.3104	-0.46	-0.24	-0.0080	1.0013	-0.0000	-0.0005	0.4163	0.360
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.13	179.0	3.22	57.87	80.63	0.3129	0.3244	-6.13	-3.29	-0.0937	0.8452	0.0148	0.0135	13.1439	8.208

Exhibit A-7 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.															
	30.	15.	2.93	38.86	68.68	0.3344	0.3544	-2.74	-1.93	-0.0467	0.2442	0.0736	0.0834	57.2983	36.8187
	30.	30.	1.41	27.23	59.22	0.3375	0.3554	3.03	2.90	0.1483	0.1789	0.0848	0.0966	54.2183	36.2857
	30.	45.	0.83	22.98	55.09	0.3415	0.3579	5.29	5.83	0.3173	0.1503	0.0914	0.1032	51.7251	35.8293
	30.	60.	0.60	20.97	52.96	0.3447	0.3602	6.21	7.61	0.4462	0.1352	0.0958	0.1074	50.3615	35.7509
	30.	75.	0.44	20.02	51.89	0.3468	0.3619	6.63	8.58	0.5262	0.1267	0.0985	0.1100	49.7575	35.8403
	30.	90.	0.39	19.73	51.56	0.3476	0.3625	6.81	8.89	0.5532	0.1233	0.0994	0.1109	49.6040	35.9023
	45.	15.	2.10	38.96	68.75	0.3191	0.3414	-2.63	-1.88	-0.0433	0.3133	0.0334	0.0704	48.3503	30.9224
	45.	30.	1.04	26.17	58.23	0.3192	0.3390	1.97	1.91	0.1051	0.2484	0.0365	0.0801	44.7929	29.7547
	45.	45.	0.68	21.49	53.52	0.3218	0.3401	3.72	4.26	0.2340	0.2169	0.0718	0.0854	42.2501	29.0213
	45.	60.	0.51	19.30	51.03	0.3241	0.3414	4.54	5.73	0.3329	0.1991	0.0753	0.0886	40.7747	28.7013
	45.	75.	0.42	18.27	49.86	0.3256	0.3424	4.93	6.54	0.3949	0.1898	0.0773	0.0903	40.0203	28.5862
	45.	90.	0.39	17.96	49.48	0.3261	0.3427	5.04	6.81	0.4160	0.1868	0.0789	0.0911	39.7899	28.5603
	60.	15.	1.73	39.13	68.39	0.3105	0.3327	-2.45	-1.74	-0.0393	0.3657	0.0497	0.0617	42.6630	27.1939
	60.	30.	0.88	25.74	57.82	0.3092	0.3287	1.54	1.50	0.0859	0.3006	0.0565	0.0699	39.2110	25.9334
	60.	45.	0.60	20.82	52.79	0.3112	0.3292	3.05	3.53	0.1943	0.2666	0.0611	0.0745	36.8195	25.1833
	60.	60.	0.47	18.53	50.16	0.3131	0.3302	3.76	4.82	0.2785	0.2471	0.0642	0.0774	35.4163	24.8304
	60.	75.	0.41	17.44	48.85	0.3143	0.3309	4.10	5.54	0.3313	0.2367	0.0660	0.0790	34.6765	24.6816
	60.	90.	0.39	17.12	48.45	0.3147	0.3312	4.20	5.77	0.3492	0.2335	0.0666	0.0795	34.4496	24.6413
	90.	15.	1.51	39.32	69.01	0.3048	0.3266	-2.23	-1.61	-0.0362	0.4065	0.0440	0.0556	38.7169	24.5966
	90.	30.	0.78	25.49	57.58	0.3027	0.3217	1.29	1.26	0.0745	0.3415	0.0500	0.0623	35.3391	23.3427
	90.	45.	0.55	20.42	52.35	0.3042	0.3217	2.65	3.09	0.1703	0.3059	0.0542	0.0670	33.1434	22.6162
	90.	60.	0.45	18.05	49.59	0.3058	0.3225	3.29	4.25	0.2449	0.2850	0.0570	0.0697	31.8276	22.2677
	90.	75.	0.41	16.93	48.21	0.3069	0.3231	3.59	4.90	0.2916	0.2739	0.0586	0.0712	31.1314	22.1157
	90.	90.	0.39	16.60	47.79	0.3073	0.3233	3.68	5.11	0.3075	0.2704	0.0592	0.0717	30.9137	22.0735
90.															
	30.	15.	2.93	22.77	54.87	0.3191	0.3411	-3.56	-3.51	-0.1117	0.2630	0.0693	0.0844	49.2333	32.4334
	30.	30.	1.41	15.53	46.39	0.3208	0.3410	0.14	0.19	0.0365	0.1985	0.0737	0.0965	45.0483	31.1781
	30.	45.	0.88	12.87	42.60	0.3243	0.3431	1.55	2.45	0.1652	0.1696	0.0846	0.1027	41.9963	30.2295
	30.	60.	0.60	11.61	40.63	0.3272	0.3453	2.29	3.84	0.2631	0.1538	0.0886	0.1067	40.2843	29.8194
	30.	75.	0.44	11.01	39.63	0.3292	0.3470	2.51	4.59	0.3238	0.1437	0.0912	0.1093	39.4309	29.7165
	30.	90.	0.39	10.82	39.32	0.3300	0.3476	2.59	4.82	0.3442	0.1403	0.0921	0.1103	39.2603	29.7156
	45.	15.	2.10	23.29	55.40	0.3042	0.3274	-3.04	-2.98	-0.0917	0.3329	0.0544	0.0707	41.6394	27.3696
	45.	30.	1.04	15.30	46.08	0.3030	0.3236	-0.08	-0.11	0.0214	0.2722	0.0608	0.0791	37.2945	25.7212
	45.	45.	0.68	12.36	41.82	0.3048	0.3240	1.04	1.68	0.1198	0.2415	0.0651	0.0836	34.3294	24.6173
	45.	60.	0.51	10.98	39.59	0.3067	0.3251	1.58	2.80	0.1954	0.2237	0.0681	0.0865	32.5863	24.0364
	45.	75.	0.42	10.33	38.46	0.3080	0.3259	1.83	3.42	0.2427	0.2141	0.0699	0.0882	31.6790	23.7632
	45.	90.	0.39	10.13	38.12	0.3084	0.3262	1.90	3.62	0.2588	0.2110	0.0705	0.0888	31.3937	23.6857

Exhibit A-7 (continued)

60.	15.	1.73	23.63	55.75	0.2959	0.3134	-2.70	-2.63	-0.0798	0.3339	0.0361	0.0617	36.7654	24.1032
60.	30.	0.83	15.24	46.00	0.2934	0.3130	-0.15	-0.20	0.0153	0.3267	0.0512	0.0665	32.6307	22.4666
60.	45.	0.69	12.15	41.49	0.2946	0.3127	0.83	1.34	0.0991	0.2947	0.0549	0.0723	29.8391	21.3990
60.	60.	0.47	10.70	39.11	0.2960	0.3133	1.29	2.31	0.1632	0.2757	0.0574	0.0748	28.2527	20.8154
60.	75.	0.41	10.01	37.91	0.2970	0.3138	1.51	2.86	0.2035	0.2655	0.0589	0.0762	27.3343	20.5231
60.	90.	0.39	9.81	37.54	0.2973	0.3140	1.58	3.04	0.2173	0.2623	0.0594	0.0766	27.1120	20.4419
90.	15.	1.51	23.67	56.00	0.2905	0.3121	-2.46	-2.39	-0.0718	0.4260	0.0407	0.0554	33.3376	21.8243
90.	30.	0.78	15.22	45.97	0.2872	0.3058	-0.17	-0.23	0.0128	0.3690	0.0450	0.0612	29.4447	20.2421
90.	45.	0.55	12.02	41.29	0.2880	0.3051	0.71	1.15	0.0855	0.3361	0.0483	0.0646	26.8335	19.2338
90.	60.	0.45	10.53	38.81	0.2891	0.3054	1.12	2.02	0.1433	0.3164	0.0505	0.0669	25.3534	18.6752
90.	75.	0.41	9.82	37.56	0.2899	0.3058	1.32	2.51	0.1791	0.3056	0.0519	0.0683	24.5366	18.3960
90.	90.	0.39	9.61	37.17	0.2902	0.3059	1.38	2.67	0.1913	0.3022	0.0523	0.0688	24.2793	18.3112

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELY	DELY	E(LUV)	E(LAB)
135.															
	30.	15.	2.93	23.01	57.12	0.3159	0.3408	-5.48	-4.99	-0.1495	0.2658	0.0681	0.0356	52.9551	34.5807
	30.	30.	1.41	16.68	47.90	0.3167	0.3402	-1.18	-1.47	-0.0281	0.2034	0.0766	0.0973	48.3415	32.9973
	30.	45.	0.88	13.61	43.71	0.3198	0.3421	0.47	0.69	0.0775	0.1746	0.0821	0.1024	44.9739	31.8040
	30.	60.	0.60	12.16	41.51	0.3227	0.3444	1.23	2.01	0.1573	0.1573	0.0861	0.1076	43.0735	31.2459
	30.	75.	0.44	11.46	40.39	0.3247	0.3462	1.58	2.72	0.2073	0.1491	0.0886	0.1103	42.1756	31.0699
	30.	90.	0.39	11.25	40.04	0.3255	0.3469	1.69	2.95	0.2240	0.1449	0.0895	0.1112	41.9257	31.0487
	45.	15.	2.10	25.95	58.02	0.3009	0.3264	-4.54	-4.08	-0.1198	0.3373	0.0531	0.0712	44.7071	29.1980
	45.	30.	1.04	16.75	47.99	0.2988	0.3220	-1.11	-1.38	-0.0269	0.2393	0.0586	0.0790	39.9934	27.1897
	45.	45.	0.68	13.35	43.33	0.3002	0.3221	0.21	0.31	0.0541	0.2506	0.0625	0.0834	36.7622	25.8779
	45.	60.	0.51	11.76	40.87	0.3019	0.3230	0.83	1.37	0.1163	0.2329	0.0653	0.0862	34.8521	25.1579
	45.	75.	0.42	11.00	39.63	0.3030	0.3238	1.12	1.96	0.1552	0.2233	0.0669	0.0878	33.8529	24.8103
	45.	90.	0.39	10.78	39.24	0.3034	0.3241	1.21	2.15	0.1684	0.2202	0.0675	0.0884	33.5492	24.7063
	60.	15.	1.73	26.51	58.55	0.2925	0.3171	-3.98	-3.55	-0.1033	0.3913	0.0448	0.0619	39.4237	25.6013
	60.	30.	0.83	16.84	48.10	0.2893	0.3110	-1.01	-1.26	-0.0247	0.3368	0.0491	0.0681	34.9697	23.7212
	60.	45.	0.60	13.27	43.20	0.2900	0.3104	0.12	0.18	0.0440	0.3062	0.0523	0.0716	31.9859	22.4714
	60.	60.	0.47	11.59	40.60	0.2912	0.3108	0.66	1.10	0.0968	0.2877	0.0546	0.0740	30.2012	21.7639
	60.	75.	0.41	10.80	39.28	0.2920	0.3112	0.92	1.61	0.1301	0.2776	0.0559	0.0753	29.2497	21.4055
	60.	90.	0.39	10.56	38.87	0.2923	0.3114	0.99	1.77	0.1414	0.2744	0.0564	0.0757	28.9505	21.2961
	90.	15.	1.51	26.89	58.91	0.2972	0.3106	-3.60	-3.20	-0.0924	0.4334	0.0395	0.0554	35.7169	23.1539
	90.	30.	0.78	16.92	48.20	0.2832	0.3036	-0.94	-1.17	-0.0228	0.3891	0.0430	0.0607	31.5247	21.3589
	90.	45.	0.55	13.22	43.14	0.2835	0.3025	0.08	0.12	0.0039	0.3492	0.0453	0.0638	28.7529	20.1821
	90.	60.	0.45	11.49	40.44	0.2844	0.3027	0.56	0.94	0.0349	0.3301	0.0478	0.0658	27.0886	19.5094
	90.	75.	0.41	10.67	39.06	0.2851	0.3029	0.79	1.40	0.1144	0.3196	0.0490	0.0670	26.1960	19.1640
	90.	90.	0.39	10.43	38.64	0.2853	0.3031	0.86	1.53	0.1245	0.3163	0.0494	0.0674	25.9141	19.0575

Exhibit A-7 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
THETA = 45.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	93.16	97.30	0.3455	0.3561	-4.85	-1.93	-0.0473	0.7958	0.0137	0.0139	12.4259	8.3664
1.0	0.02	0.05	89.19	95.67	0.3560	0.3649	-9.73	-3.92	-0.0959	0.6620	0.0265	0.0254	23.0379	15.6595
1.0	0.02	0.10	89.40	95.75	0.3555	0.3642	-10.79	-4.32	-0.1049	0.6368	0.0289	0.0279	25.5069	17.1992
1.0	0.02	0.20	90.87	96.36	0.3528	0.3620	-11.19	-4.43	-0.1062	0.6251	0.0295	0.0290	26.7645	17.9144
1.0	0.02	0.50	92.92	97.20	0.3507	0.3609	-11.71	-4.56	-0.1079	0.6168	0.0299	0.0298	27.7691	18.4041
1.0	0.02	0.80	93.54	97.45	0.3506	0.3611	-11.85	-4.60	-0.1084	0.6165	0.0299	0.0299	27.8579	18.5404
1.0	0.05	0.05	92.64	97.09	0.3457	0.3551	-6.28	-2.50	-0.0617	0.7876	0.0162	0.0156	14.5474	9.6964
1.0	0.05	0.10	89.05	95.61	0.3535	0.3604	-11.14	-4.47	-0.1102	0.6936	0.0269	0.0242	23.3642	15.5264
1.0	0.05	0.20	90.46	96.19	0.3512	0.3587	-11.60	-4.60	-0.1119	0.6732	0.0278	0.0258	24.6399	16.4520
1.0	0.05	0.50	92.42	97.00	0.3494	0.3580	-12.21	-4.77	-0.1143	0.6621	0.0286	0.0269	26.1434	17.2074
1.0	0.05	0.80	93.02	97.24	0.3494	0.3583	-12.37	-4.81	-0.1149	0.6615	0.0287	0.0270	26.2630	17.2832
1.0	0.10	0.10	95.13	98.09	0.3375	0.3459	-5.06	-1.99	-0.0501	0.8778	0.0108	0.0096	9.6284	6.3602
1.0	0.10	0.20	92.86	97.17	0.3416	0.3481	-9.20	-3.62	-0.0907	0.8072	0.0183	0.0152	16.3729	10.5870
1.0	0.10	0.50	94.82	97.97	0.3401	0.3477	-9.81	-3.80	-0.0935	0.7902	0.0193	0.0166	17.7510	11.3983
1.0	0.10	0.80	95.42	98.20	0.3401	0.3480	-9.97	-3.84	-0.0944	0.7893	0.0194	0.0167	17.9060	11.4985
1.0	0.20	0.20	98.75	99.52	0.3284	0.3365	-3.31	-1.27	-0.0332	0.9570	0.0051	0.0036	4.6402	2.9236
1.0	0.20	0.50	98.30	99.34	0.3299	0.3372	-6.33	-2.42	-0.0625	0.9214	0.0091	0.0061	8.3624	5.2691
1.0	0.20	0.80	98.89	99.57	0.3303	0.3375	-6.50	-2.47	-0.0636	0.9202	0.0093	0.0062	8.5478	5.3868
1.0	0.50	0.50	103.68	101.49	0.3213	0.3309	-0.95	-0.36	-0.0100	0.9992	0.0005	-0.0001	0.6677	0.5005
1.0	0.50	0.80	103.56	101.36	0.3216	0.3309	-1.83	-0.68	-0.0192	0.9987	0.0009	-0.0003	1.2482	0.9525
1.0	0.80	0.80	105.11	101.94	0.3207	0.3311	-0.28	-0.11	-0.0031	1.0008	-0.0000	-0.0002	0.1896	0.1599
0.3	0.02	0.02	34.99	65.70	0.3317	0.3422	-0.07	-0.05	0.0003	0.8196	0.0123	0.0127	7.8152	5.3310
0.3	0.02	0.05	41.92	70.84	0.3319	0.3424	-0.87	-0.59	-0.0166	0.6910	0.0232	0.0237	16.2573	10.7302
0.3	0.02	0.10	51.01	76.71	0.3293	0.3418	-2.88	-1.71	-0.0477	0.6346	0.0274	0.0292	21.8578	14.2945
0.3	0.02	0.20	64.53	84.25	0.3300	0.3448	-5.93	-2.98	-0.0772	0.6097	0.0294	0.0320	26.3189	16.9807
0.3	0.02	0.50	84.22	93.55	0.3397	0.3549	-10.12	-4.22	-0.1014	0.6095	0.0301	0.0315	28.4474	18.5795
0.3	0.02	0.80	90.58	96.24	0.3459	0.3593	-11.35	-4.50	-0.1066	0.6143	0.0300	0.0306	28.1953	18.6171
0.3	0.05	0.05	42.55	71.29	0.3214	0.3315	-0.23	-0.16	-0.0035	0.8262	0.0127	0.0127	8.9783	5.8033
0.3	0.05	0.10	51.96	77.23	0.3246	0.3350	-1.93	-1.14	-0.0329	0.7097	0.0226	0.0224	17.6709	11.1650
0.3	0.05	0.20	64.93	84.49	0.3273	0.3404	-5.48	-2.74	-0.0728	0.6594	0.0263	0.0276	23.5950	14.9307
0.3	0.05	0.50	83.99	93.45	0.3384	0.3519	-10.35	-4.32	-0.1055	0.6506	0.0283	0.0285	26.7600	17.2744
0.3	0.05	0.80	90.14	96.06	0.3447	0.3564	-11.79	-4.68	-0.1124	0.6561	0.0288	0.0277	26.6151	17.3758
0.3	0.10	0.10	53.75	78.33	0.3092	0.3193	-0.15	-0.09	-0.0023	0.9033	0.0072	0.0067	5.6166	3.4230
0.3	0.10	0.20	67.38	85.71	0.3166	0.3279	-3.07	-1.52	-0.0422	0.7971	0.0161	0.0151	14.0389	8.6011
0.3	0.10	0.50	86.39	94.48	0.3290	0.3412	-7.95	-3.29	-0.0827	0.7766	0.0194	0.0178	18.1424	11.4079
0.3	0.10	0.80	92.55	97.05	0.3355	0.3460	-9.38	-3.69	-0.0913	0.7828	0.0196	0.0172	18.1959	11.5630
0.3	0.20	0.20	70.41	87.21	0.3038	0.3153	-0.04	-0.02	-0.0012	0.9560	0.0033	0.0025	2.6745	1.5506
0.3	0.20	0.50	89.86	95.94	0.3188	0.3303	-4.47	-1.83	-0.0485	0.9054	0.0092	0.0069	8.5225	5.1832
0.3	0.20	0.80	96.02	98.44	0.3254	0.3353	-5.91	-2.30	-0.0596	0.9124	0.0095	0.0066	8.7812	5.4533
0.3	0.50	0.50	94.37	97.78	0.3102	0.3236	0.03	0.01	-0.0003	0.9901	0.0006	0.0003	0.5326	0.3027
0.3	0.50	0.80	100.69	100.27	0.3171	0.3288	-1.24	-0.47	-0.0139	0.9897	0.0013	0.0001	1.2953	0.8555
0.3	0.80	0.80	101.95	100.75	0.3160	0.3287	0.02	0.01	-0.0001	0.9961	0.0002	0.0000	0.1606	0.0944

Exhibit A-7 (continued)

0.0	0.02	0.02	9.93	37.76	0.2856	0.2957	1.98	3.85	0.2509	0.6333	0.0189	0.0203	6.8636	5.8906
0.0	0.02	0.05	21.66	53.69	0.2960	0.3088	2.93	3.29	0.1618	0.5868	0.0260	0.0238	14.3731	9.9571
0.0	0.02	0.10	34.56	65.43	0.3038	0.3200	0.51	0.40	0.0238	0.5303	0.0285	0.0330	21.1724	13.5733
0.0	0.02	0.20	53.24	78.03	0.3146	0.3332	-3.68	-2.11	-0.0552	0.5866	0.0293	0.0343	26.5553	16.8249
0.0	0.02	0.50	89.49	91.91	0.3344	0.3520	-9.43	-4.06	-0.0982	0.6039	0.0302	0.0323	28.7326	18.6400
0.0	0.02	0.80	89.31	95.72	0.3438	0.3584	-11.13	-4.46	-0.1057	0.6122	0.0301	0.0309	28.3447	18.6517
0.0	0.05	0.05	21.09	53.08	0.2836	0.2945	2.36	2.68	0.1273	0.7449	0.0136	0.0145	7.1470	5.1959
0.0	0.05	0.10	36.07	66.60	0.2981	0.3117	2.02	1.57	0.0603	0.6492	0.0228	0.0246	16.1543	10.2406
0.0	0.05	0.20	54.06	78.52	0.3116	0.3283	-2.85	-1.63	-0.0430	0.6327	0.0269	0.0294	23.5146	14.6547
0.0	0.05	0.50	90.37	91.86	0.3331	0.3490	-9.55	-4.11	-0.1011	0.6436	0.0289	0.0293	27.0703	17.3236
0.0	0.05	0.80	88.91	95.55	0.3426	0.3555	-11.53	-4.62	-0.1113	0.6534	0.0289	0.0280	26.7700	17.4157
0.0	0.10	0.10	36.01	66.56	0.2819	0.2938	1.96	1.53	0.0574	0.8573	0.0066	0.0067	4.3191	2.9452
0.0	0.10	0.20	56.46	79.89	0.3006	0.3150	-0.45	-0.25	-0.0053	0.7672	0.0159	0.0162	13.5516	8.1001
0.0	0.10	0.50	82.77	92.92	0.3238	0.3380	-7.15	-3.05	-0.0773	0.7683	0.0196	0.0183	18.3693	11.4442
0.0	0.10	0.80	91.31	96.54	0.3334	0.3450	-9.13	-3.63	-0.0899	0.7795	0.0197	0.0175	18.3273	11.6225
0.0	0.20	0.20	58.27	80.90	0.2877	0.3015	1.36	0.76	0.0232	0.9399	0.0030	0.0027	2.2529	1.4654
0.0	0.20	0.50	86.23	94.42	0.3136	0.3271	-3.68	-1.55	-0.0415	0.8956	0.0094	0.0074	8.6724	5.2006
0.0	0.20	0.80	94.79	97.95	0.3233	0.3344	-5.66	-2.22	-0.0578	0.9035	0.0096	0.0068	8.6911	5.4879
0.0	0.50	0.50	90.38	96.16	0.3050	0.3202	0.46	0.19	0.0045	0.9844	0.0003	0.0005	0.6301	0.3922
0.0	0.50	0.80	99.46	99.79	0.3151	0.3278	-0.99	-0.38	-0.0115	0.9853	0.0014	0.0002	1.3623	0.8433
0.0	0.80	0.80	100.60	100.23	0.3140	0.3277	0.16	0.06	0.0013	0.9933	0.0003	0.0001	0.2310	0.1406

Exhibit A-7 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	88.70	95.46	0.3474	0.3577	-5.88	-2.41	-0.0602	0.7936	0.0139	0.0141	12.3322	8.4949
1.0	0.02	0.05	79.46	91.45	0.3605	0.3683	-11.36	-4.89	-0.1231	0.6550	0.0276	0.0262	22.7700	15.8642
1.0	0.02	0.10	74.02	88.94	0.3612	0.3674	-11.44	-5.14	-0.1321	0.6381	0.0296	0.0280	23.9431	16.6618
1.0	0.02	0.20	67.32	85.68	0.3572	0.3625	-10.06	-4.83	-0.1278	0.6345	0.0295	0.0286	23.7173	16.3694
1.0	0.02	0.50	57.36	80.40	0.3453	0.3520	-8.12	-4.35	-0.1197	0.6231	0.0296	0.0306	24.1700	16.3080
1.0	0.02	0.80	54.05	78.51	0.3381	0.3477	-7.53	-4.19	-0.1166	0.6244	0.0297	0.0317	24.6034	16.6132
1.0	0.05	0.05	83.30	93.15	0.3502	0.3586	-7.53	-3.19	-0.0313	0.7763	0.0172	0.0165	14.7331	10.1022
1.0	0.05	0.10	73.00	88.46	0.3604	0.3647	-12.46	-5.63	-0.1456	0.6839	0.0239	0.0253	22.8910	15.7846
1.0	0.05	0.20	66.53	85.28	0.3561	0.3595	-10.85	-5.23	-0.1397	0.6835	0.0284	0.0257	22.4082	15.3163
1.0	0.05	0.50	56.90	80.14	0.3438	0.3488	-8.59	-4.61	-0.1285	0.6748	0.0282	0.0274	22.6153	15.1101
1.0	0.05	0.80	53.69	78.30	0.3367	0.3445	-7.89	-4.41	-0.1242	0.6699	0.0282	0.0284	23.0347	15.2136
1.0	0.10	0.10	79.36	91.40	0.3439	0.3502	-6.10	-2.68	-0.0712	0.8698	0.0123	0.0108	10.3512	6.9602
1.0	0.10	0.20	67.99	86.02	0.3471	0.3493	-9.39	-4.49	-0.1229	0.8177	0.0194	0.0153	15.4093	10.3377
1.0	0.10	0.50	58.36	80.96	0.3343	0.3379	-7.12	-3.79	-0.1086	0.8065	0.0187	0.0165	15.1672	9.9204
1.0	0.10	0.80	55.15	79.15	0.3272	0.3333	-6.43	-3.56	-0.1031	0.8005	0.0183	0.0173	15.4731	10.0039
1.0	0.20	0.20	73.36	88.63	0.3337	0.3378	-4.03	-1.88	-0.0533	0.9607	0.0051	0.0040	5.0250	3.3634
1.0	0.20	0.50	60.43	82.11	0.3240	0.3268	-5.01	-2.63	-0.0788	0.9411	0.0084	0.0054	6.9541	4.5916
1.0	0.20	0.80	57.27	80.35	0.3169	0.3220	-4.31	-2.36	-0.0714	0.9336	0.0085	0.0060	7.1105	4.5748
1.0	0.50	0.50	64.29	84.13	0.3158	0.3207	-1.19	-0.61	-0.0195	1.0096	0.0002	-0.0007	0.8290	0.7458
1.0	0.50	0.80	60.10	81.91	0.3087	0.3151	-1.48	-0.79	-0.0258	1.0120	0.0003	-0.0009	1.0362	0.9742
1.0	0.80	0.80	61.21	82.51	0.3082	0.3155	-0.37	-0.20	-0.0064	1.0072	-0.0003	-0.0005	0.3514	0.2864
0.3	0.02	0.02	30.44	62.06	0.3349	0.3444	-1.10	-0.93	-0.0330	0.8308	0.0121	0.0125	7.3520	5.1503
0.3	0.02	0.05	32.19	63.53	0.3350	0.3434	-2.50	-2.01	-0.0691	0.7151	0.0223	0.0232	14.6556	9.9969
0.3	0.02	0.10	35.63	66.26	0.3292	0.3387	-3.53	-2.63	-0.0949	0.6592	0.0266	0.0286	19.0182	12.7272
0.3	0.02	0.20	40.97	70.18	0.3244	0.3363	-4.80	-3.24	-0.0977	0.6268	0.0286	0.0321	22.7750	15.0128
0.3	0.02	0.50	48.66	75.26	0.3263	0.3408	-6.53	-3.91	-0.1106	0.6164	0.0296	0.0332	25.0497	16.4508
0.3	0.02	0.80	51.09	76.76	0.3295	0.3439	-7.03	-4.07	-0.1138	0.6179	0.0296	0.0328	25.0593	16.5263
0.3	0.05	0.05	33.21	64.36	0.3250	0.3329	-1.48	-1.18	-0.0412	0.8428	0.0128	0.0127	8.3718	5.5922
0.3	0.05	0.10	35.91	66.48	0.3247	0.3319	-3.24	-2.41	-0.0894	0.7404	0.0221	0.0218	15.5109	10.1396
0.3	0.05	0.20	41.05	70.24	0.3217	0.3316	-4.72	-3.19	-0.0980	0.6813	0.0259	0.0274	20.3231	13.2060
0.3	0.05	0.50	48.46	75.14	0.3247	0.3374	-6.73	-4.03	-0.1159	0.6601	0.0281	0.0298	23.4065	15.2062
0.3	0.05	0.80	50.81	76.59	0.3281	0.3406	-7.31	-4.24	-0.1203	0.6616	0.0282	0.0295	23.5061	15.3402
0.3	0.10	0.10	37.97	68.03	0.3099	0.3167	-1.19	-0.87	-0.0300	0.9212	0.0072	0.0066	5.1799	3.2689
0.3	0.10	0.20	42.52	71.25	0.3111	0.3187	-3.26	-2.17	-0.0697	0.8237	0.0152	0.0145	11.9753	7.5408
0.3	0.10	0.50	49.92	76.04	0.3153	0.3258	-5.26	-3.12	-0.0925	0.7888	0.0186	0.0182	15.6520	9.9322
0.3	0.10	0.80	52.28	77.47	0.3188	0.3292	-5.84	-3.36	-0.0981	0.7902	0.0189	0.0181	15.8713	10.1241
0.3	0.20	0.20	45.01	72.92	0.2988	0.3063	-0.76	-0.50	-0.0173	0.9724	0.0030	0.0021	2.2842	1.3786
0.3	0.20	0.50	52.04	77.33	0.3051	0.3143	-3.15	-1.84	-0.0575	0.9196	0.0085	0.0067	7.0930	4.3975
0.3	0.20	0.80	54.39	78.71	0.3087	0.3178	-3.73	-2.11	-0.0648	0.9210	0.0088	0.0067	7.4359	4.6605
0.3	0.50	0.50	54.98	79.05	0.2971	0.3076	-0.21	-0.12	-0.0044	0.9970	0.0004	-0.0000	0.3397	0.2314
0.3	0.50	0.80	57.23	80.33	0.3008	0.3109	-0.89	-0.50	-0.0169	0.9969	0.0009	-0.0002	0.9736	0.7246
0.3	0.80	0.80	58.06	80.79	0.2999	0.3110	-0.06	-0.03	-0.0013	0.9992	0.0001	-0.0001	0.0375	0.0690

Exhibit A-7 (continued)

0.0	0.02	0.02	5.47	28.07	0.2682	0.2740	0.95	2.72	0.2121	0.6759	0.0166	0.0193	4.5739	4.3867
0.0	0.02	0.05	11.93	41.14	0.2731	0.2877	1.30	2.15	0.1285	0.6053	0.0234	0.0234	10.9333	8.0477
0.0	0.02	0.10	19.18	50.93	0.2860	0.2999	-0.14	-0.16	0.0040	0.5925	0.0285	0.0334	17.6258	11.7241
0.0	0.02	0.20	29.68	61.41	0.2967	0.3142	-2.55	-2.15	-0.0670	0.5935	0.0293	0.0356	22.9953	14.8685
0.0	0.02	0.50	44.93	72.87	0.3164	0.3349	-5.35	-3.70	-0.1057	0.6070	0.0295	0.0345	25.5091	16.5596
0.0	0.02	0.80	49.33	75.98	0.3256	0.3421	-6.81	-4.01	-0.1125	0.6142	0.0296	0.0333	25.2634	16.5793
0.0	0.05	0.05	11.74	40.84	0.2665	0.2732	1.11	1.85	0.1057	0.7632	0.0119	0.0139	5.1260	3.9671
0.0	0.05	0.10	20.02	51.90	0.2893	0.2999	0.71	0.81	0.0427	0.6655	0.0207	0.0244	12.9530	9.5135
0.0	0.05	0.20	30.13	61.80	0.2937	0.3089	-2.10	-1.76	-0.0556	0.6419	0.0253	0.0302	20.1308	12.8092
0.0	0.05	0.50	44.84	72.81	0.3149	0.3315	-5.93	-3.75	-0.1091	0.6482	0.0280	0.0311	23.8498	15.3072
0.0	0.05	0.80	49.53	75.83	0.3242	0.3389	-7.06	-4.16	-0.1185	0.6568	0.0282	0.0300	23.7197	15.4004
0.0	0.10	0.10	20.23	52.14	0.2653	0.2728	0.92	1.05	0.0477	0.8792	0.0053	0.0063	3.1035	2.2043
0.0	0.10	0.20	31.60	63.04	0.2830	0.2949	-0.63	-0.52	-0.0156	0.7734	0.0145	0.0162	11.2474	6.9458
0.0	0.10	0.50	46.31	73.77	0.3056	0.3197	-4.47	-2.80	-0.0838	0.7743	0.0137	0.0192	15.9327	10.0065
0.0	0.10	0.80	51.05	76.73	0.3150	0.3274	-5.59	-3.27	-0.0958	0.7843	0.0190	0.0185	16.0564	10.1033
0.0	0.20	0.20	32.87	64.08	0.2710	0.2812	0.64	0.52	0.0192	0.9463	0.0026	0.0025	1.6077	1.0674
0.0	0.20	0.50	48.42	75.11	0.2956	0.3080	-2.35	-1.45	-0.0460	0.9019	0.0037	0.0073	7.3303	4.4338
0.0	0.20	0.80	53.16	77.99	0.3050	0.3159	-3.47	-2.00	-0.0618	0.9133	0.0090	0.0071	7.5979	4.7115
0.0	0.50	0.50	50.99	76.69	0.2876	0.3009	0.21	0.13	0.0038	0.9864	0.0006	0.0005	0.4364	0.2745
0.0	0.50	0.80	56.00	79.63	0.2972	0.3090	-0.64	-0.36	-0.0123	0.9834	0.0012	0.0002	1.0512	0.6890
0.0	0.80	0.80	56.71	80.03	0.2962	0.3090	0.07	0.04	0.0010	0.9946	0.0002	0.0001	0.1571	0.0972

Exhibit A-7 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0

THETA = 135.0

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	88.94	95.35	0.3467	0.3570	-5.97	-2.44	-0.0605	0.7952	0.0138	0.0141	12.4027	8.6983
1.0	0.02	0.05	89.01	91.70	0.3536	0.3667	-11.59	-4.96	-0.1236	0.6565	0.0273	0.0262	22.8624	15.8610
1.0	0.02	0.10	75.03	89.42	0.3581	0.3650	-11.81	-5.26	-0.1329	0.6406	0.0294	0.0233	24.3709	16.8379
1.0	0.02	0.20	69.08	86.55	0.3528	0.3594	-10.62	-5.00	-0.1294	0.6341	0.0285	0.0293	24.6263	16.9211
1.0	0.02	0.50	60.16	81.94	0.3399	0.3491	-8.92	-4.62	-0.1229	0.6266	0.0296	0.0315	25.4929	16.9903
1.0	0.02	0.80	57.17	80.29	0.3331	0.3453	-8.40	-4.50	-0.1205	0.6232	0.0296	0.0324	25.8954	17.1652
1.0	0.05	0.05	83.94	93.43	0.3433	0.3563	-7.66	-3.23	-0.0814	0.7687	0.0169	0.0163	14.0964	10.0220
1.0	0.05	0.10	74.08	88.97	0.3569	0.3618	-12.78	-5.71	-0.1457	0.6960	0.0282	0.0251	22.9502	15.7057
1.0	0.05	0.20	68.30	86.17	0.3514	0.3561	-11.39	-5.39	-0.1407	0.6853	0.0281	0.0260	23.0509	15.6926
1.0	0.05	0.50	59.67	81.67	0.3383	0.3457	-9.42	-4.88	-0.1317	0.6741	0.0289	0.0281	23.7590	15.7083
1.0	0.05	0.80	56.77	80.07	0.3315	0.3419	-8.80	-4.72	-0.1283	0.6696	0.0289	0.0290	24.1951	15.8329
1.0	0.10	0.10	89.65	91.98	0.3405	0.3471	-6.21	-2.70	-0.0707	0.8767	0.0118	0.0103	10.1595	6.7847
1.0	0.10	0.20	69.95	86.98	0.3420	0.3493	-9.75	-4.57	-0.1225	0.8226	0.0187	0.0152	15.4903	10.3079
1.0	0.10	0.50	61.31	82.56	0.3283	0.3364	-7.77	-4.00	-0.1107	0.8071	0.0185	0.0163	15.8814	10.3742
1.0	0.10	0.80	58.41	80.93	0.3220	0.3304	-7.16	-3.81	-0.1063	0.8014	0.0185	0.0175	16.1599	10.3815
1.0	0.20	0.20	73.60	89.68	0.3289	0.3337	-4.10	-1.87	-0.0521	0.9650	0.0055	0.0036	4.8967	3.2155
1.0	0.20	0.50	63.69	83.82	0.3184	0.3230	-5.39	-2.74	-0.0792	0.9427	0.0081	0.0054	7.1295	4.6903
1.0	0.20	0.80	60.79	82.28	0.3117	0.3139	-4.78	-2.51	-0.0733	0.9354	0.0082	0.0060	7.3683	4.7251
1.0	0.50	0.50	67.87	85.95	0.3104	0.3169	-1.21	-0.60	-0.0186	1.0101	0.0001	-0.0007	0.7977	0.7295
1.0	0.50	0.80	63.98	83.97	0.3037	0.3119	-1.59	-0.82	-0.0257	1.0129	0.0002	-0.0009	1.0026	0.9062
1.0	0.80	0.80	65.19	84.66	0.3032	0.3124	-0.38	-0.19	-0.0060	1.0073	-0.0003	-0.0005	0.3504	0.2894
0.3	0.02	0.02	30.68	62.26	0.3329	0.3426	-1.19	-0.99	-0.0342	0.8523	0.0119	0.0125	7.4989	5.1750
0.3	0.02	0.05	32.73	63.97	0.3314	0.3403	-2.73	-2.16	-0.0717	0.7186	0.0224	0.0232	14.0334	10.0032
0.3	0.02	0.10	36.66	67.03	0.3247	0.3352	-3.90	-2.84	-0.0985	0.6604	0.0262	0.0239	19.6670	13.0663
0.3	0.02	0.20	42.73	71.49	0.3195	0.3330	-5.36	-3.51	-0.1018	0.6267	0.0233	0.0327	23.3140	15.5670
0.3	0.02	0.50	51.46	76.98	0.3214	0.3382	-7.33	-4.22	-0.1149	0.6159	0.0293	0.0338	26.3057	17.1250
0.3	0.02	0.80	54.21	78.60	0.3248	0.3416	-7.90	-4.33	-0.1181	0.6174	0.0294	0.0334	26.3225	17.2021
0.3	0.05	0.05	33.25	64.37	0.3213	0.3295	-1.61	-1.26	-0.0424	0.8474	0.0123	0.0125	8.3642	5.5554
0.3	0.05	0.10	36.99	67.29	0.3199	0.3279	-3.57	-2.59	-0.0831	0.7649	0.0214	0.0216	15.7622	10.2056
0.3	0.05	0.20	42.63	71.46	0.3166	0.3230	-5.26	-3.44	-0.1019	0.6829	0.0254	0.0277	21.1236	13.6489
0.3	0.05	0.50	51.23	76.84	0.3193	0.3347	-7.56	-4.35	-0.1204	0.6606	0.0277	0.0303	24.7182	15.7089
0.3	0.05	0.80	53.89	78.42	0.3233	0.3382	-8.22	-4.57	-0.1248	0.6629	0.0279	0.0300	24.6362	15.9472
0.3	0.10	0.10	39.26	68.97	0.3052	0.3125	-1.29	-0.92	-0.0305	0.9256	0.0067	0.0062	5.0609	3.4022
0.3	0.10	0.20	44.47	72.57	0.3053	0.3147	-3.62	-2.34	-0.0719	0.8273	0.0146	0.0144	12.2313	7.6569
0.3	0.10	0.50	52.38	77.82	0.3103	0.3227	-5.91	-3.37	-0.0960	0.7907	0.0132	0.0184	16.2933	10.2799
0.3	0.10	0.80	55.04	79.37	0.3139	0.3265	-6.57	-3.62	-0.1018	0.7919	0.0136	0.0163	16.3583	10.4005
0.3	0.20	0.20	47.26	74.38	0.2939	0.3022	-0.83	-0.53	-0.0173	0.9750	0.0027	0.0019	2.1730	1.3131
0.3	0.20	0.50	55.25	79.21	0.3002	0.3110	-3.54	-1.99	-0.0595	0.9223	0.0031	0.0066	7.2357	4.5000
0.3	0.20	0.80	57.91	80.71	0.3039	0.3149	-4.19	-2.28	-0.0672	0.9226	0.0036	0.0067	7.6782	4.6010
0.3	0.50	0.50	58.56	81.07	0.2924	0.3043	-0.23	-0.13	-0.0044	0.9973	0.0003	-0.0000	0.3040	0.2137
0.3	0.50	0.80	61.10	82.45	0.2962	0.3079	-1.00	-0.54	-0.0174	0.9903	0.0003	-0.0002	0.9653	0.7496
0.3	0.80	0.80	62.04	82.95	0.2954	0.3081	-0.97	-0.04	-0.0013	0.9993	0.0000	-0.0001	0.0792	0.0651

Figure A-7 (continued)

0.0	0.02	0.02	5.71	28.70	0.2635	0.2702	0.07	2.38	0.1861	0.6832	0.0154	0.0157	4.4833	3.2118
0.0	0.02	0.05	12.47	41.99	0.2733	0.2840	1.07	1.71	0.1062	0.6162	0.0232	0.0238	11.2247	8.0550
0.0	0.02	0.10	20.20	52.10	0.2815	0.2967	-0.50	-0.56	-0.0299	0.5907	0.0245	0.0332	16.3143	12.0200
0.0	0.02	0.20	31.44	62.91	0.2922	0.3114	-3.10	-2.51	-0.0750	0.5964	0.0275	0.0357	24.0178	15.4870
0.0	0.02	0.30	47.73	74.67	0.3118	0.3325	-6.65	-4.03	-0.1107	0.6075	0.0291	0.0350	26.7851	17.2532
0.0	0.02	0.50	52.94	77.86	0.3210	0.3309	-7.68	-4.33	-0.1170	0.6141	0.0293	0.0333	26.5123	17.2532
0.0	0.02	0.80	60.69	82.23	0.2919	0.3062	0.07	0.04	0.0009	0.9951	0.0092	0.0091	0.1804	0.0775
0.0	0.05	0.05	12.38	41.85	0.2621	0.2696	0.98	1.57	0.0913	0.7736	0.0110	0.0133	5.1010	3.5735
0.0	0.05	0.10	21.09	53.03	0.2756	0.2874	0.38	0.42	0.0226	0.6747	0.0106	0.0229	13.3564	8.6223
0.0	0.05	0.20	31.91	63.30	0.2891	0.3059	-2.64	-2.13	-0.0640	0.6467	0.0245	0.0302	20.9247	13.2824
0.0	0.05	0.30	47.62	74.60	0.3103	0.3290	-6.76	-4.10	-0.1144	0.6493	0.0275	0.0314	24.9317	15.8027
0.0	0.05	0.50	52.66	77.69	0.3196	0.3365	-7.96	-4.50	-0.1202	0.6577	0.0279	0.0305	24.6342	16.0912
0.0	0.05	0.80	60.69	82.23	0.2919	0.3062	0.07	0.04	0.0009	0.9951	0.0092	0.0091	0.1804	0.0775
0.0	0.10	0.10	21.52	53.55	0.2612	0.2694	0.82	0.69	0.0412	0.8553	0.0058	0.0060	3.0359	2.1068
0.0	0.10	0.20	33.55	64.64	0.2735	0.2916	-0.99	-0.79	-0.0225	0.7830	0.0139	0.0159	11.5960	7.0042
0.0	0.10	0.30	49.26	75.64	0.3010	0.3168	-5.12	-3.07	-0.0882	0.7774	0.0182	0.0193	16.6135	10.3486
0.0	0.10	0.50	54.31	78.66	0.3103	0.3247	-6.32	-3.53	-0.0997	0.7856	0.0185	0.0187	16.7268	10.5492
0.0	0.10	0.80	60.69	82.23	0.2919	0.3062	0.07	0.04	0.0009	0.9951	0.0092	0.0091	0.1804	0.0775
0.0	0.20	0.20	35.11	65.86	0.2679	0.2730	0.57	0.44	0.0166	0.9593	0.0023	0.0023	1.5226	0.9954
0.0	0.20	0.30	51.63	77.08	0.2911	0.3050	-2.74	-1.62	-0.0439	0.9058	0.0084	0.0074	7.3150	4.5321
0.0	0.20	0.50	56.68	80.02	0.3004	0.3130	-3.94	-2.17	-0.0645	0.9169	0.0087	0.0070	7.3258	4.6458
0.0	0.20	0.80	60.69	82.23	0.2919	0.3062	0.07	0.04	0.0009	0.9951	0.0092	0.0091	0.1804	0.0775
0.0	0.50	0.50	54.37	78.31	0.2933	0.2980	0.19	0.11	0.0032	0.9836	0.0306	0.0304	0.3953	0.2451
0.0	0.50	0.80	59.87	81.79	0.2928	0.3062	-0.75	-0.41	-0.0136	0.9904	0.0211	0.0091	1.0204	0.6253
0.0	0.80	0.80	60.69	82.23	0.2919	0.3062	0.07	0.04	0.0009	0.9951	0.0092	0.0091	0.1804	0.0775

Exhibit A-7 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1660 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 120.0 THETA LENGTH RP/RVO		RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.															
20.	0.00	172.5	6.77	81.29	92.27	0.3779	0.3816	-23.86	-9.69	-0.2283	0.4204	0.0585	0.0504	48.1181	32.791
20.	0.02	171.4	7.33	83.38	93.15	0.3682	0.3714	-21.91	-8.83	-0.2111	0.5202	0.0436	0.0401	40.6797	27.691
20.	0.05	170.1	8.08	85.96	94.30	0.3570	0.3599	-19.29	-7.69	-0.1876	0.6093	0.0373	0.0287	31.8586	20.718
20.	0.10	168.1	9.11	89.71	95.83	0.3445	0.3477	-15.61	-6.14	-0.1542	0.7368	0.0246	0.0164	21.5493	13.741
20.	0.20	165.4	10.53	95.17	98.10	0.3313	0.3361	-10.27	-3.96	-0.1042	0.9172	0.0112	0.0047	10.3960	6.728
20.	0.50	161.8	12.56	102.62	101.09	0.3214	0.3302	-3.01	-1.13	-0.0322	1.0091	0.0003	-0.0013	1.9536	1.692
20.	0.80	164.7	10.97	104.78	101.82	0.3206	0.3303	-0.91	-0.34	-0.0160	1.0026	-0.0002	-0.0007	0.6507	0.529
40.	0.00	168.3	9.04	72.47	83.21	0.3599	0.3602	-32.86	-13.82	-0.3269	0.3960	0.0691	0.0409	58.1609	35.905
40.	0.02	164.9	10.83	75.15	89.47	0.3762	0.3687	-30.21	-12.56	-0.3023	0.4625	0.0562	0.0373	44.5669	29.462
40.	0.05	160.4	13.23	78.75	91.13	0.3621	0.3563	-26.64	-10.92	-0.2663	0.5791	0.0420	0.0269	34.5875	22.491
40.	0.10	154.4	16.52	83.81	93.37	0.3468	0.3437	-21.64	-8.69	-0.2219	0.7343	0.0266	0.0123	23.2662	15.196
40.	0.20	146.1	21.01	91.21	96.50	0.3316	0.3328	-14.32	-5.60	-0.1494	0.9219	0.0112	0.0013	11.4281	8.056
40.	0.50	135.3	26.37	101.39	100.53	0.3209	0.3290	-4.27	-1.61	-0.0462	1.0049	0.0002	-0.0025	2.7236	2.315
40.	0.80	164.8	10.93	104.39	101.67	0.3203	0.3304	-1.32	-0.49	-0.0143	1.0050	-0.0005	-0.0011	0.9227	0.791
60.	0.00	153.8	14.18	69.08	86.56	0.3689	0.3762	-36.37	-15.51	-0.3666	0.4603	0.0687	0.0443	52.2160	35.229
60.	0.02	152.7	17.45	72.00	87.93	0.3755	0.3648	-33.47	-14.09	-0.3339	0.5032	0.0554	0.0333	43.6611	29.042
60.	0.05	144.9	21.69	75.95	89.84	0.3610	0.3527	-29.55	-12.24	-0.2944	0.6262	0.0407	0.0213	33.3372	22.005
60.	0.10	134.4	27.36	81.49	92.36	0.3456	0.3403	-24.04	-9.74	-0.2473	0.7823	0.0252	0.0093	22.6348	15.102
60.	0.20	120.0	35.13	89.62	95.84	0.3305	0.3309	-15.97	-6.23	-0.1675	0.9296	0.0099	-0.0005	11.3476	8.026
60.	0.50	133.7	27.71	100.87	100.34	0.3204	0.3284	-4.81	-1.82	-0.0518	1.0039	-0.0003	-0.0021	3.0295	2.593
60.	0.80	164.8	10.91	104.22	101.61	0.3201	0.3302	-1.50	-0.56	-0.0160	1.0070	-0.0007	-0.0013	1.1430	0.998
80.	0.00	133.5	27.86	67.79	85.91	0.3875	0.3746	-37.75	-16.19	-0.3807	0.4048	0.0672	0.0431	51.2152	34.629
80.	0.02	124.9	32.49	70.80	87.49	0.3742	0.3632	-34.75	-14.70	-0.3520	0.5136	0.0533	0.0318	42.0289	28.430
80.	0.05	113.8	38.47	74.87	89.34	0.3597	0.3514	-30.70	-12.77	-0.3130	0.6424	0.0383	0.0192	32.0270	21.669
80.	0.10	99.1	46.43	80.60	91.96	0.3445	0.3397	-24.99	-10.16	-0.2574	0.8036	0.0239	0.0062	21.0414	15.027
80.	0.20	104.8	43.37	89.60	95.58	0.3296	0.3302	-16.63	-6.55	-0.1740	0.9859	0.0099	-0.0013	11.0262	8.462
80.	0.50	133.8	27.67	100.66	100.26	0.3201	0.3282	-5.03	-1.99	-0.0533	1.0122	-0.0007	-0.0033	3.1335	2.622
80.	0.80	164.8	10.91	104.14	101.53	0.3200	0.3302	-1.58	-0.59	-0.0166	1.0035	-0.0009	-0.0014	1.2102	0.968
100.	0.00	92.1	50.21	67.34	85.69	0.3867	0.3742	-38.25	-16.43	-0.3847	0.4032	0.0661	0.0427	50.5570	34.282
100.	0.02	92.8	49.81	70.39	87.20	0.3734	0.3628	-35.22	-14.93	-0.3557	0.5177	0.0523	0.0313	42.0095	28.309
100.	0.05	94.6	48.86	74.49	89.17	0.3590	0.3510	-31.12	-12.96	-0.3163	0.6672	0.0384	0.0195	32.2758	21.661
100.	0.10	98.8	46.62	80.28	91.82	0.3438	0.3394	-25.35	-10.32	-0.2601	0.7948	0.0232	0.0079	21.5021	14.891
100.	0.20	104.9	43.31	88.78	95.49	0.3292	0.3299	-16.89	-6.66	-0.1759	0.9897	0.0095	-0.0016	10.7951	8.405
100.	0.50	133.8	27.66	100.58	100.23	0.3200	0.3282	-5.13	-1.94	-0.0544	1.0147	-0.0003	-0.0033	3.1525	2.709
100.	0.80	164.8	10.90	104.12	101.57	0.3199	0.3301	-1.61	-0.60	-0.0163	1.0098	-0.0009	-0.0013	1.2531	0.960
110.	0.00	92.1	50.19	67.28	85.66	0.3865	0.3741	-38.34	-16.47	-0.3851	0.4004	0.0659	0.0427	50.6025	34.316
110.	0.02	92.9	49.80	70.33	87.17	0.3732	0.3623	-35.30	-14.96	-0.3561	0.5192	0.0526	0.0313	41.9949	28.167
110.	0.05	94.6	48.85	74.44	89.14	0.3588	0.3510	-31.20	-13.00	-0.3167	0.6639	0.0382	0.0195	32.1437	21.619
110.	0.10	98.3	46.61	80.24	91.80	0.3437	0.3393	-25.42	-10.34	-0.2604	0.7967	0.0230	0.0078	21.5086	14.568
110.	0.20	104.9	43.30	88.74	95.48	0.3291	0.3299	-16.93	-6.67	-0.1761	0.9924	0.0094	-0.0016	10.7937	8.407
110.	0.50	133.8	27.66	100.57	100.22	0.3200	0.3282	-5.14	-1.95	-0.0544	1.0156	-0.0009	-0.0033	3.1613	2.707
110.	0.80	164.8	10.90	104.11	101.57	0.3199	0.3301	-1.62	-0.61	-0.0163	1.0102	-0.0010	-0.0014	1.2569	0.963
115.	0.00	92.2	50.19	67.27	85.65	0.3864	0.3741	-38.36	-16.48	-0.3852	0.4000	0.0658	0.0427	50.6063	34.309
115.	0.02	92.9	49.80	70.32	87.16	0.3732	0.3628	-35.32	-14.97	-0.3562	0.5198	0.0525	0.0313	41.9868	28.162

Exhibit A-7 (continued)

115.	0.05	94.6	48.85	74.43	89.14	0.3588	0.3510	-31.21	-13.00	-0.3167	0.6496	0.0381	0.0195	32.1095	21.597
115.	0.10	98.8	46.61	80.23	91.79	0.3437	0.3393	-25.43	-10.35	-0.2604	0.7974	0.0230	0.0078	21.3649	14.852
115.	0.20	104.9	43.30	88.74	95.48	0.3291	0.3299	-16.94	-6.68	-0.1761	0.9331	0.0033	-0.0016	10.7116	8.401
115.	0.50	133.8	27.66	100.57	100.22	0.3200	0.3282	-5.15	-1.95	-0.0545	1.0159	-0.0009	-0.0033	3.1612	2.707
115.	0.80	164.8	10.90	104.11	101.57	0.3199	0.3301	-1.62	-0.61	-0.0163	1.0104	-0.0010	-0.0014	1.2617	0.963
118.	0.00	92.2	50.19	67.27	85.65	0.3364	0.3741	-38.37	-16.49	-0.3352	0.4101	0.0653	0.0427	50.3694	34.225
118.	0.02	92.9	49.79	70.32	87.16	0.3732	0.3628	-35.33	-14.98	-0.3562	0.5201	0.0525	0.0313	41.8136	28.127
118.	0.05	94.6	48.85	74.43	89.14	0.3588	0.3510	-31.22	-13.01	-0.3167	0.6499	0.0381	0.0195	32.0977	21.593
118.	0.10	98.8	46.61	80.23	91.79	0.3437	0.3393	-25.44	-10.35	-0.2604	0.7977	0.0230	0.0078	21.3549	14.849
118.	0.20	104.9	43.30	88.74	95.47	0.3291	0.3299	-16.95	-6.68	-0.1761	0.9434	0.0033	-0.0016	10.7053	8.393
118.	0.50	133.8	27.66	100.57	100.22	0.3199	0.3282	-5.15	-1.95	-0.0545	1.0161	-0.0009	-0.0033	3.1613	2.707
118.	0.80	164.8	10.90	104.11	101.57	0.3199	0.3301	-1.62	-0.61	-0.0163	1.0104	-0.0010	-0.0014	1.2623	0.964
119.	0.00	92.2	50.19	67.27	85.65	0.3364	0.3741	-38.37	-16.49	-0.3352	0.4102	0.0653	0.0427	50.3459	34.224
119.	0.02	92.9	49.79	70.31	87.16	0.3732	0.3628	-35.33	-14.98	-0.3562	0.5202	0.0525	0.0313	41.8105	28.126
119.	0.05	94.6	48.85	74.43	89.14	0.3588	0.3510	-31.22	-13.01	-0.3167	0.6500	0.0381	0.0195	32.0943	21.591
119.	0.10	98.8	46.61	80.23	91.79	0.3437	0.3393	-25.44	-10.35	-0.2604	0.7978	0.0230	0.0078	21.3526	14.848
119.	0.20	104.9	43.30	88.74	95.47	0.3291	0.3299	-16.95	-6.68	-0.1761	0.9435	0.0033	-0.0016	10.7038	8.392
119.	0.50	133.8	27.66	100.57	100.22	0.3199	0.3282	-5.15	-1.95	-0.0545	1.0161	-0.0009	-0.0033	3.1611	2.707
119.	0.80	164.8	10.90	104.11	101.57	0.3199	0.3301	-1.62	-0.61	-0.0163	1.0105	-0.0010	-0.0014	1.2625	0.964

Exhibit A-7 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 120.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.																
	20.	0.00	173.4	6.25	44.84	72.81	0.3605	0.3685	-14.66	-8.77	-0.2438	0.4245	0.0584	0.0552	42.6402	28.934
	20.	0.02	172.3	6.86	46.04	73.60	0.3501	0.3567	-13.46	-7.99	-0.2254	0.5270	0.0480	0.0435	35.7986	23.777
	20.	0.05	170.8	7.67	47.66	74.63	0.3385	0.3439	-11.84	-6.95	-0.2005	0.6487	0.0363	0.0306	27.7605	18.650
	20.	0.10	168.7	8.79	49.93	76.04	0.3257	0.3304	-9.58	-5.54	-0.1649	0.7884	0.0234	0.0171	18.4804	11.837
	20.	0.20	165.8	10.37	53.22	78.02	0.3126	0.3178	-6.30	-3.57	-0.1115	0.9290	0.0102	0.0046	8.6333	5.711
	20.	0.50	161.9	12.49	57.69	80.58	0.3032	0.3117	-1.84	-1.02	-0.0345	1.0066	0.0005	-0.0015	1.6031	1.396
	20.	0.80	164.7	10.96	58.98	81.30	0.3024	0.3124	-0.56	-0.31	-0.0107	1.0058	-0.0003	-0.0003	0.5766	0.492
	40.	0.00	171.5	7.30	39.35	69.03	0.3706	0.3667	-20.16	-12.56	-0.3495	0.4060	0.0633	0.0535	46.3361	31.925
	40.	0.02	167.7	9.33	40.98	70.18	0.3570	0.3533	-18.53	-11.40	-0.3232	0.5169	0.0547	0.0401	38.4656	25.597
	40.	0.05	162.9	11.96	43.17	71.69	0.3423	0.3393	-16.34	-9.89	-0.2874	0.6477	0.0400	0.0261	29.4671	19.312
	40.	0.10	156.3	15.50	46.25	73.73	0.3270	0.3253	-13.27	-7.86	-0.2364	0.7966	0.0245	0.0123	19.4824	12.923
	40.	0.20	147.3	20.38	50.75	76.55	0.3121	0.3139	-8.78	-5.05	-0.1599	0.9432	0.0096	0.0007	9.3057	6.231
	40.	0.50	135.6	26.69	56.92	80.15	0.3024	0.3103	-2.61	-1.45	-0.0495	1.0162	-0.0003	-0.0029	2.3199	2.046
	40.	0.80	164.8	10.92	58.74	81.16	0.3021	0.3119	-0.81	-0.44	-0.0153	1.0105	-0.0007	-0.0013	0.8366	0.711
	60.	0.00	164.6	11.03	37.21	67.46	0.3695	0.3618	-22.30	-14.13	-0.3920	0.4157	0.0670	0.0486	45.1729	30.593
	60.	0.02	157.9	14.66	39.00	68.78	0.3554	0.3486	-20.52	-12.82	-0.3625	0.5290	0.0529	0.0354	37.3003	24.989
	60.	0.05	149.2	19.34	41.40	70.43	0.3405	0.3351	-18.11	-11.11	-0.3224	0.6622	0.0380	0.0219	28.4235	18.985
	60.	0.10	137.7	25.56	44.79	72.78	0.3251	0.3221	-14.73	-8.82	-0.2651	0.8126	0.0225	0.0080	18.6809	12.593
	60.	0.20	122.0	34.04	49.75	75.93	0.3106	0.3117	-9.78	-5.66	-0.1793	0.9581	0.0080	-0.0016	9.1312	7.184
	60.	0.50	133.9	27.64	56.60	79.97	0.3018	0.3096	-2.94	-1.63	-0.0555	1.0239	-0.0009	-0.0036	2.6319	2.304
	60.	0.80	164.8	10.90	58.63	81.10	0.3018	0.3117	-0.92	-0.50	-0.0172	1.0141	-0.0010	-0.0015	1.0401	0.810
	80.	0.00	141.7	23.40	36.38	66.34	0.3675	0.3597	-23.14	-14.75	-0.4072	0.4243	0.0650	0.0465	44.0335	30.040
	80.	0.02	132.2	28.55	38.23	68.22	0.3535	0.3467	-21.30	-13.33	-0.3766	0.5393	0.0509	0.0335	36.3002	24.493
	80.	0.05	119.9	35.17	40.71	70.00	0.3387	0.3334	-18.81	-11.60	-0.3349	0.6741	0.0361	0.0202	27.5494	18.681
	80.	0.10	103.7	43.92	44.21	72.40	0.3236	0.3207	-15.31	-9.20	-0.2754	0.8254	0.0210	0.0075	18.0345	12.770
	80.	0.20	105.5	42.95	49.35	75.69	0.3096	0.3108	-10.19	-5.91	-0.1862	0.9697	0.0069	-0.0024	8.8768	7.244
	80.	0.50	134.0	27.59	56.46	79.89	0.3014	0.3094	-3.08	-1.71	-0.0576	1.0297	-0.0013	-0.0038	2.7534	2.393
	80.	0.80	164.8	10.89	58.58	81.08	0.3017	0.3117	-0.97	-0.53	-0.0178	1.0169	-0.0011	-0.0016	1.1134	0.851
	100.	0.00	94.3	49.02	36.09	66.62	0.3663	0.3592	-23.44	-14.93	-0.4114	0.4307	0.0637	0.0460	43.4954	29.769
	100.	0.02	94.7	48.83	37.95	68.01	0.3524	0.3461	-21.58	-13.59	-0.3804	0.5471	0.0497	0.0329	35.7435	24.264
	100.	0.05	96.0	48.10	40.47	69.83	0.3377	0.3329	-19.07	-11.77	-0.3383	0.6830	0.0351	0.0197	27.0642	18.505
	100.	0.10	99.7	46.10	44.01	72.26	0.3228	0.3203	-15.53	-9.34	-0.2782	0.8349	0.0201	0.0071	17.6580	12.663
	100.	0.20	105.7	42.88	49.20	75.60	0.3091	0.3105	-10.34	-6.01	-0.1831	0.9734	0.0063	-0.0027	8.6919	7.219
	100.	0.50	134.0	27.58	56.41	79.86	0.3012	0.3093	-3.14	-1.74	-0.0582	1.0340	-0.0015	-0.0039	2.7932	2.416
	100.	0.80	164.9	10.89	58.56	81.07	0.3016	0.3116	-0.99	-0.54	-0.0180	1.0189	-0.0012	-0.0016	1.1460	0.897
	110.	0.00	94.3	49.00	36.04	66.58	0.3661	0.3591	-23.49	-15.02	-0.4113	0.4327	0.0634	0.0459	43.3702	29.717
	110.	0.02	94.7	48.81	37.91	67.98	0.3522	0.3461	-21.62	-13.62	-0.3808	0.5495	0.0495	0.0329	35.6312	24.218
	110.	0.05	96.0	48.09	40.43	69.80	0.3375	0.3328	-19.11	-11.80	-0.3386	0.6859	0.0349	0.0196	26.9500	18.466
	110.	0.10	99.7	46.09	43.97	72.24	0.3227	0.3202	-15.56	-9.37	-0.2785	0.8380	0.0200	0.0070	17.5729	12.634
	110.	0.20	105.7	42.88	49.18	75.58	0.3089	0.3103	-10.36	-6.02	-0.1833	0.9811	0.0062	-0.0027	8.6441	7.206
	110.	0.50	134.0	27.58	56.40	79.86	0.3012	0.3093	-3.15	-1.75	-0.0582	1.0353	-0.0016	-0.0039	2.7930	2.418
	110.	0.80	164.9	10.89	58.56	81.06	0.3016	0.3116	-0.99	-0.54	-0.0180	1.0196	-0.0012	-0.0016	1.1521	0.899

Exhibit A-7 (continued)

115.	0.00	94.3	49.00	36.04	66.58	0.3660	0.3591	-23.50	-15.02	-0.4113	0.4334	0.0633	0.0459	43.3426	29.706
115.	0.02	94.7	48.81	37.90	67.98	0.3521	0.3461	-21.63	-13.62	-0.3693	0.5503	0.0494	0.0329	35.6052	24.207
115.	0.05	96.0	48.09	40.42	69.89	0.3375	0.3328	-19.11	-11.81	-0.3385	0.6363	0.0343	0.0196	26.9353	18.457
115.	0.10	99.7	46.09	43.97	72.23	0.3226	0.3202	-15.57	-9.37	-0.2785	0.8309	0.0199	0.0070	17.5520	12.626
115.	0.20	105.7	42.88	49.17	75.58	0.3039	0.3105	-10.37	-6.02	-0.1833	0.9329	0.0062	-0.0027	8.6320	7.201
115.	0.50	134.0	27.58	56.40	79.86	0.3012	0.3093	-3.15	-1.75	-0.0582	1.0353	-0.0016	-0.0039	2.7984	2.418
115.	0.80	164.9	10.89	58.56	81.06	0.3016	0.3116	-0.99	-0.54	-0.0180	1.0193	-0.0012	-0.0016	1.1534	0.870
118.	0.00	94.3	49.00	36.04	66.58	0.3660	0.3591	-23.50	-15.03	-0.4113	0.4336	0.0633	0.0459	43.3355	29.703
118.	0.02	94.7	48.81	37.90	67.98	0.3521	0.3461	-21.63	-13.63	-0.3803	0.5506	0.0494	0.0329	35.5984	24.205
118.	0.05	96.0	48.09	40.42	69.79	0.3375	0.3328	-19.11	-11.81	-0.3336	0.6372	0.0343	0.0196	26.9291	18.454
118.	0.10	99.7	46.09	43.97	72.23	0.3226	0.3202	-15.57	-9.37	-0.2785	0.8394	0.0199	0.0070	17.5476	12.624
118.	0.20	105.7	42.88	49.17	75.58	0.3039	0.3105	-10.37	-6.02	-0.1833	0.9324	0.0062	-0.0027	8.6285	7.200
118.	0.50	134.0	27.58	56.40	79.86	0.3012	0.3093	-3.15	-1.75	-0.0582	1.0359	-0.0016	-0.0039	2.7984	2.418
118.	0.80	164.9	10.89	58.56	81.06	0.3016	0.3116	-0.99	-0.54	-0.0180	1.0199	-0.0012	-0.0016	1.1537	0.870
119.	0.00	94.3	49.00	36.04	66.58	0.3660	0.3591	-23.50	-15.03	-0.4113	0.4337	0.0633	0.0459	43.3343	29.703
119.	0.02	94.7	48.81	37.90	67.98	0.3521	0.3461	-21.63	-13.63	-0.3803	0.5507	0.0494	0.0329	35.5973	24.204
119.	0.05	96.0	48.09	40.42	69.79	0.3375	0.3328	-19.11	-11.81	-0.3336	0.6372	0.0343	0.0196	26.9289	18.454
119.	0.10	99.7	46.09	43.97	72.23	0.3226	0.3202	-15.57	-9.37	-0.2785	0.8395	0.0199	0.0070	17.5466	12.624
119.	0.20	105.7	42.88	49.17	75.58	0.3039	0.3105	-10.37	-6.03	-0.1833	0.9324	0.0062	-0.0027	8.6278	7.200
119.	0.50	134.0	27.58	56.40	79.86	0.3012	0.3093	-3.15	-1.75	-0.0582	1.0360	-0.0016	-0.0039	2.7984	2.418
119.	0.80	164.9	10.89	58.56	81.06	0.3016	0.3116	-0.99	-0.54	-0.0180	1.0199	-0.0012	-0.0016	1.1537	0.870

Exhibit A-7 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 120.0

THETA	LENGTH	RP/RVO	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	DRATIO	DELX	DELY	E(LUV)	E(LAB)
133.																
	20.	0.00	174.1	5.89	47.25	74.37	0.3564	0.3673	-16.65	-9.55	-0.2542	0.6246	0.0582	0.0365	44.7165	30.139
	20.	0.02	172.9	6.54	43.59	75.22	0.3457	0.3550	-15.29	-8.70	-0.2332	0.5293	0.0475	0.0442	37.4073	24.699
	20.	0.05	171.3	7.39	50.40	76.34	0.3339	0.3419	-13.46	-7.57	-0.2092	0.6383	0.0356	0.0309	28.5524	18.669
	20.	0.10	169.2	8.56	52.94	77.85	0.3209	0.3277	-10.69	-6.03	-0.1722	0.7051	0.0227	0.0170	19.0600	12.302
	20.	0.20	166.1	10.22	56.63	79.99	0.3079	0.3149	-7.17	-3.89	-0.1165	0.9364	0.0095	0.0063	8.7709	5.574
	20.	0.50	162.0	12.45	61.63	82.73	0.2936	0.3008	-2.11	-1.11	-0.0351	1.0109	0.0002	-0.0017	1.6750	1.422
	20.	0.80	160.7	10.96	63.03	83.50	0.2930	0.3096	-0.64	-0.34	-0.0112	1.0379	-0.0004	-0.0009	0.6858	0.583
	40.	0.00	173.7	6.09	49.20	70.13	0.3658	0.3650	-22.93	-13.76	-0.3643	0.4100	0.0675	0.0534	48.2100	32.494
	40.	0.02	169.7	8.24	42.74	71.49	0.3517	0.3569	-21.09	-12.49	-0.3374	0.5263	0.0505	0.0403	39.0998	26.369
	40.	0.05	164.6	11.04	45.21	73.05	0.3368	0.3364	-18.60	-10.63	-0.2901	0.6386	0.0333	0.0257	29.2784	19.906
	40.	0.10	157.6	14.79	48.68	75.27	0.3214	0.3222	-15.11	-8.60	-0.2369	0.8103	0.0231	0.0116	19.5587	13.153
	40.	0.20	143.1	19.94	53.76	78.34	0.3068	0.3105	-10.01	-5.52	-0.1671	0.9572	0.0034	-0.0000	9.3628	7.092
	40.	0.50	135.8	26.57	60.74	82.25	0.2976	0.3073	-2.99	-1.59	-0.0517	1.0233	-0.0007	-0.0022	2.4009	2.191
	40.	0.80	164.8	10.91	62.79	83.35	0.2975	0.3091	-0.93	-0.49	-0.0160	1.0141	-0.0009	-0.0014	0.9922	0.734
	60.	0.00	168.7	8.82	33.40	68.34	0.3637	0.3596	-25.39	-15.53	-0.4293	0.4336	0.0654	0.0490	46.6037	31.683
	60.	0.02	161.5	12.72	40.42	69.79	0.3493	0.3457	-23.37	-14.03	-0.3783	0.5412	0.0519	0.0351	33.3054	25.707
	60.	0.05	152.2	17.71	43.14	71.67	0.3342	0.3317	-20.64	-12.19	-0.3307	0.6536	0.0359	0.0211	23.9262	19.562
	60.	0.10	140.0	24.33	46.97	74.19	0.3189	0.3184	-16.89	-9.67	-0.2669	0.8722	0.0206	0.0070	13.6970	13.021
	60.	0.20	123.4	33.28	52.53	77.65	0.3049	0.3081	-11.17	-6.29	-0.1878	0.9572	0.0065	-0.0026	9.1522	7.803
	60.	0.50	134.0	27.58	60.35	82.05	0.2969	0.3066	-3.38	-1.79	-0.0580	1.0233	-0.0015	-0.0020	2.6782	2.475
	60.	0.80	164.8	10.89	62.66	83.23	0.2972	0.3089	-1.06	-0.56	-0.0179	1.0180	-0.0012	-0.0016	1.1751	0.997
	80.	0.00	167.5	20.26	37.41	67.61	0.3611	0.3573	-26.36	-16.25	-0.4251	0.4252	0.0623	0.0467	45.3694	31.692
	80.	0.02	157.3	25.79	39.49	69.13	0.3463	0.3433	-24.27	-14.72	-0.3931	0.5352	0.0483	0.0329	32.9207	25.210
	80.	0.05	124.2	32.87	42.31	71.11	0.3319	0.3293	-21.44	-12.74	-0.3497	0.6948	0.0336	0.0192	23.5935	19.204
	80.	0.10	107.0	42.19	46.23	73.75	0.3170	0.3169	-17.47	-10.10	-0.2876	0.8305	0.0187	0.0063	13.0547	13.163
	80.	0.20	106.1	42.66	52.10	77.36	0.3036	0.3071	-11.64	-6.43	-0.1945	0.9923	0.0052	-0.0034	8.8264	7.509
	80.	0.50	134.1	27.54	60.19	81.96	0.2964	0.3063	-3.54	-1.83	-0.0602	1.0314	-0.0020	-0.0042	3.0365	2.500
	80.	0.80	164.9	10.89	62.60	83.25	0.2970	0.3088	-1.12	-0.59	-0.0185	1.0224	-0.0013	-0.0017	1.2658	0.987
	100.	0.00	95.9	48.16	37.04	67.34	0.3596	0.3567	-26.70	-16.51	-0.4294	0.4439	0.0612	0.0461	44.6643	30.761
	100.	0.02	96.0	48.12	39.16	68.89	0.3454	0.3429	-24.59	-14.96	-0.3971	0.5557	0.0470	0.0323	32.4886	24.952
	100.	0.05	97.0	47.56	42.01	70.90	0.3307	0.3292	-21.74	-12.95	-0.3532	0.7063	0.0323	0.0182	22.8256	19.014
	100.	0.10	100.4	45.73	46.02	73.58	0.3160	0.3164	-17.72	-10.26	-0.2905	0.8523	0.0177	0.0059	12.6249	13.093
	100.	0.20	106.2	42.59	51.92	77.25	0.3029	0.3068	-11.81	-6.59	-0.1965	1.0042	0.0066	-0.0037	8.7664	7.574
	100.	0.50	134.1	27.52	60.12	81.92	0.2962	0.3062	-3.60	-1.92	-0.0603	1.0469	-0.0022	-0.0042	3.0075	2.622
	100.	0.80	164.9	10.88	62.58	83.24	0.2970	0.3088	-1.14	-0.60	-0.0183	1.0250	-0.0014	-0.0017	1.2973	0.992
	110.	0.00	95.9	48.14	36.99	67.29	0.3592	0.3566	-26.76	-16.55	-0.4293	0.4466	0.0609	0.0461	44.5210	30.643
	110.	0.02	96.0	48.10	39.10	68.85	0.3450	0.3429	-24.64	-14.99	-0.3974	0.5589	0.0467	0.0323	32.3063	24.903
	110.	0.05	97.0	47.55	41.96	70.87	0.3304	0.3291	-21.73	-12.98	-0.3535	0.7106	0.0320	0.0181	22.7067	18.973
	110.	0.10	100.4	45.72	45.98	73.56	0.3158	0.3163	-17.75	-10.29	-0.2907	0.8563	0.0175	0.0059	12.5928	13.022
	110.	0.20	106.2	42.58	51.89	77.23	0.3028	0.3068	-11.84	-6.60	-0.1966	1.0077	0.0044	-0.0037	8.6581	7.562
	110.	0.50	134.1	27.52	60.11	81.91	0.2961	0.3062	-3.61	-1.92	-0.0603	1.0456	-0.0022	-0.0042	3.1063	2.625
	110.	0.80	164.9	10.88	62.53	83.23	0.2969	0.3088	-1.14	-0.60	-0.0183	1.0258	-0.0015	-0.0017	1.3151	0.999

Exhibit A-7 (continued)

115.	0.00	95.9	48.14	36.98	67.29	0.3592	0.3566	-26.76	-16.56	-0.4293	0.4474	0.0603	0.0461	44.4921	30.682
115.	0.02	96.0	48.10	39.09	68.85	0.3450	0.3428	-24.64	-15.00	-0.3975	0.5699	0.0466	0.0323	36.2776	24.893
115.	0.05	97.0	47.55	41.95	70.86	0.3304	0.3291	-21.79	-12.93	-0.3535	0.7117	0.0320	0.0186	27.1722	18.964
115.	0.10	100.4	45.72	45.97	73.55	0.3158	0.3163	-17.76	-10.29	-0.2907	0.8574	0.0174	0.0058	17.5095	13.022
115.	0.20	106.2	42.58	51.88	77.23	0.3028	0.3068	-11.84	-6.61	-0.1966	1.0003	0.0044	-0.0037	8.6466	7.557
115.	0.50	134.1	27.52	60.11	81.91	0.2961	0.3062	-3.61	-1.92	-0.0603	1.0402	-0.0023	-0.0042	3.1073	2.625
115.	0.80	164.9	10.83	62.58	83.23	0.2969	0.3088	-1.14	-0.60	-0.0183	1.0260	-0.0015	-0.0017	1.3166	0.961
118.	0.00	95.9	48.14	36.97	67.29	0.3591	0.3566	-26.76	-16.56	-0.4293	0.4476	0.0603	0.0461	44.4968	30.689
118.	0.02	96.0	48.10	39.09	68.84	0.3450	0.3428	-24.64	-15.00	-0.3974	0.5702	0.0466	0.0323	36.2726	24.896
118.	0.05	97.0	47.55	41.95	70.86	0.3303	0.3291	-21.79	-12.93	-0.3534	0.7120	0.0320	0.0186	27.1774	18.962
118.	0.10	100.4	45.72	45.97	73.55	0.3158	0.3163	-17.76	-10.29	-0.2907	0.8578	0.0174	0.0058	17.5052	13.020
118.	0.20	106.2	42.58	51.88	77.23	0.3028	0.3068	-11.84	-6.61	-0.1966	1.0001	0.0044	-0.0037	8.6482	7.556
118.	0.50	134.1	27.52	60.11	81.91	0.2961	0.3062	-3.61	-1.92	-0.0603	1.0403	-0.0023	-0.0042	3.1073	2.624
118.	0.80	164.9	10.83	62.58	83.23	0.2969	0.3088	-1.14	-0.60	-0.0183	1.0261	-0.0015	-0.0017	1.3169	0.961
119.	0.00	95.9	48.14	36.97	67.29	0.3591	0.3566	-26.76	-16.56	-0.4293	0.4477	0.0603	0.0461	44.4965	30.689
119.	0.02	96.0	48.10	39.09	68.84	0.3450	0.3428	-24.64	-15.00	-0.3974	0.5703	0.0466	0.0323	36.2722	24.895
119.	0.05	97.0	47.55	41.95	70.86	0.3303	0.3291	-21.79	-12.93	-0.3534	0.7121	0.0320	0.0186	27.1769	18.962
119.	0.10	100.4	45.72	45.97	73.55	0.3158	0.3163	-17.76	-10.29	-0.2907	0.8579	0.0174	0.0058	17.5049	13.019
119.	0.20	106.2	42.58	51.88	77.23	0.3028	0.3068	-11.84	-6.61	-0.1966	1.0002	0.0044	-0.0037	8.6484	7.556
119.	0.50	134.1	27.52	60.11	81.91	0.2961	0.3062	-3.61	-1.92	-0.0603	1.0403	-0.0023	-0.0042	3.1073	2.624
119.	0.80	164.9	10.83	62.58	83.23	0.2969	0.3088	-1.14	-0.60	-0.0183	1.0261	-0.0015	-0.0017	1.3169	0.961

Exhibit A-7 (concluded)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 5821.
SIGMA Z (M) = 300.
SO2-SO4 CONVERSION RATE= 0.0152 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.1064 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY (UG/M3)	BSP-TOTAL (10-4 M-1)	BSPSN/BS (%)
H+2S												
INCREMENT!	0.010	0.007	0.000	69.868	2.893	0.002	0.047	0.602	-0.006	0.687	0.010	13.652
TOTAL AMB!	0.010	0.007	0.000	69.869	2.893	0.002	2.983	27.569	0.032	13.623	0.138	61.456
H+1S												
INCREMENT!	0.023	0.016	0.000	67.838	0.432	0.005	0.020	0.105	-0.011	1.649	0.021	2.683
TOTAL AMB!	0.023	0.016	0.000	67.839	0.432	0.005	2.956	13.518	0.027	14.585	0.149	56.802
H												
INCREMENT!	0.039	0.026	0.000	64.782	0.224	0.008	0.018	0.058	-0.015	2.760	0.035	1.503
TOTAL AMB!	0.039	0.026	0.000	64.782	0.224	0.008	2.954	8.533	0.023	15.696	0.163	51.550
H-1S												
INCREMENT!	0.034	0.022	0.000	64.503	0.360	0.007	0.025	0.091	-0.015	2.353	0.030	2.334
TOTAL AMB!	0.034	0.022	0.000	64.503	0.360	0.007	2.961	9.035	0.023	15.289	0.153	53.283
H-2S												
INCREMENT!	0.032	0.020	0.000	61.499	1.039	0.007	0.065	0.248	-0.018	2.283	0.030	6.111
TOTAL AMB!	0.032	0.020	0.000	61.499	1.039	0.007	3.001	10.293	0.020	15.219	0.158	53.885
0												
INCREMENT!	0.029	0.018	0.003	55.197	10.574	0.007	0.543	2.072	-0.018	2.283	0.044	35.259
TOTAL AMB!	0.029	0.018	0.003	55.197	10.574	0.007	3.479	11.939	0.020	15.219	0.172	57.531

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

SO2!	0.0000
NOX!	0.0000
PRIMARY PARTICULATE!	0.0000
SO4!	0.0000
NO3!	0.0000

Exhibit A-8. Printout from plume-based PLUVUE calculations for observed points at 220 and 240 km from the source. The end of the printout also includes the tables of secondary aerosol conversion rates and the table verifying the data for plotting.

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	30.	0.02	180.5	2.46	93.33	97.37	0.3451	0.3555	-11.56	-4.50	-0.1032	0.6916	0.0263	0.0245	24.2245	15.802
	30.	0.05	178.8	3.35	91.76	96.73	0.3470	0.3557	-13.15	-5.14	-0.1247	0.6934	0.0281	0.0247	25.3663	16.661
	30.	0.10	176.5	4.58	91.85	96.76	0.3433	0.3502	-13.06	-5.10	-0.1263	0.7574	0.0244	0.0192	21.7631	13.901
	30.	0.20	173.5	6.21	95.40	98.19	0.3319	0.3386	-9.51	-3.67	-0.0952	0.8918	0.0130	0.0076	11.8261	7.652
	30.	0.50	170.2	8.02	102.27	100.87	0.3204	0.3304	-2.64	-1.00	-0.0265	0.9919	0.0015	-0.0007	2.0256	1.510
	30.	0.80	169.8	8.20	104.22	101.61	0.3191	0.3306	-0.68	-0.26	-0.0069	0.9954	0.0003	-0.0005	0.5930	0.463
	45.	0.02	181.9	1.70	95.18	98.11	0.3421	0.3539	-9.73	-3.76	-0.0896	0.7043	0.0232	0.0232	21.9777	14.899
	45.	0.05	180.5	2.43	93.64	97.49	0.3443	0.3547	-11.27	-4.33	-0.1053	0.7012	0.0254	0.0237	23.4650	15.297
	45.	0.10	178.8	3.37	93.92	97.60	0.3406	0.3494	-10.99	-4.26	-0.1043	0.7663	0.0217	0.0184	19.7969	12.662
	45.	0.20	177.0	4.33	97.76	99.13	0.3293	0.3378	-7.14	-2.74	-0.0705	0.9090	0.0104	0.0060	9.5424	5.907
	45.	0.50	174.5	5.65	102.93	101.12	0.3201	0.3307	-1.98	-0.74	-0.0212	0.9933	0.0013	-0.0003	1.5525	1.120
	45.	0.80	173.8	6.05	104.40	101.67	0.3191	0.3307	-0.51	-0.19	-0.0059	0.9966	0.0002	-0.0003	0.4428	0.332
	60.	0.02	182.4	1.39	96.19	98.51	0.3400	0.3524	-8.72	-3.36	-0.0797	0.7190	0.0212	0.0216	20.3653	13.814
	60.	0.05	181.3	2.00	94.94	98.01	0.3417	0.3529	-9.97	-3.86	-0.0926	0.7199	0.0223	0.0219	21.4650	13.937
	60.	0.10	180.0	2.72	95.68	98.31	0.3373	0.3471	-9.23	-3.56	-0.0874	0.7953	0.0184	0.0161	17.1296	10.953
	60.	0.20	178.5	3.51	98.91	99.58	0.3278	0.3372	-6.09	-2.29	-0.0539	0.9195	0.0039	0.0061	8.2842	5.183
	60.	0.50	176.5	4.60	103.25	101.24	0.3209	0.3308	-1.66	-0.62	-0.0177	0.9941	0.0011	-0.0003	1.3197	0.947
	60.	0.80	175.9	4.93	104.48	101.71	0.3191	0.3303	-0.43	-0.16	-0.0049	0.9972	0.0002	-0.0002	0.3702	0.281
	90.	0.02	182.7	1.22	96.87	98.78	0.3336	0.3512	-8.04	-3.09	-0.0732	0.7317	0.0197	0.0201	19.1140	12.503
	90.	0.05	181.7	1.76	95.76	98.34	0.3400	0.3516	-9.15	-3.53	-0.0846	0.7383	0.0212	0.0206	20.0759	13.066
	90.	0.10	180.7	2.34	96.78	98.74	0.3352	0.3456	-8.13	-3.12	-0.0767	0.8139	0.0163	0.0145	15.3512	9.812
	90.	0.20	179.4	3.03	99.63	99.86	0.3269	0.3367	-5.28	-2.01	-0.0517	0.9237	0.0089	0.0056	7.4475	4.660
	90.	0.50	177.6	3.98	103.45	101.32	0.3199	0.3309	-1.46	-0.55	-0.0155	0.9947	0.0010	-0.0001	1.1718	0.834
	90.	0.80	177.1	4.27	104.53	101.72	0.3190	0.3308	-0.38	-0.14	-0.0043	0.9975	0.0002	-0.0002	0.3255	0.249
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.24	179.1	3.21	100.40	100.15	0.3251	0.3349	-4.51	-1.71	-0.0447	0.9479	0.0062	0.0039	5.7717	3.613
90.																
	30.	0.02	180.8	2.27	52.41	77.54	0.3275	0.3395	-7.03	-4.03	-0.1146	0.6943	0.0253	0.0263	21.4462	13.953
	30.	0.05	179.2	3.13	51.44	76.97	0.3293	0.3397	-8.04	-4.61	-0.1321	0.6973	0.0275	0.0264	22.3370	14.463
	30.	0.10	176.9	4.35	51.49	77.00	0.3253	0.3335	-7.99	-4.58	-0.1341	0.7633	0.0236	0.0208	18.9422	12.107
	30.	0.20	173.8	6.03	53.64	78.27	0.3140	0.3209	-5.85	-3.31	-0.1015	0.8999	0.0122	0.0077	10.0113	6.365
	30.	0.50	170.3	7.94	57.79	80.64	0.3029	0.3123	-1.69	-0.93	-0.0317	0.9973	0.0011	-0.0002	1.6441	1.223
	30.	0.80	169.9	8.15	58.97	81.29	0.3018	0.3126	-0.52	-0.23	-0.0102	0.9993	0.0001	-0.0007	0.5437	0.460
	45.	0.02	182.1	1.56	53.54	78.21	0.3246	0.3378	-5.95	-3.36	-0.0943	0.7065	0.0223	0.0245	19.5380	12.749
	45.	0.05	180.8	2.25	52.59	77.65	0.3267	0.3386	-6.89	-3.92	-0.1116	0.7044	0.0249	0.0254	20.7032	13.505
	45.	0.10	179.1	3.18	52.76	77.75	0.3228	0.3327	-6.72	-3.82	-0.1112	0.7732	0.0210	0.0195	17.3464	11.103
	45.	0.20	177.2	4.20	55.09	79.11	0.3116	0.3202	-4.39	-2.46	-0.0753	0.9148	0.0093	0.0070	8.1459	5.123
	45.	0.50	174.7	5.59	58.22	80.88	0.3028	0.3127	-1.27	-0.70	-0.0235	0.9975	0.0010	-0.0005	1.2554	0.995
	45.	0.80	173.9	6.00	59.10	81.36	0.3018	0.3128	-0.38	-0.21	-0.0075	0.9994	0.0001	-0.0005	0.4062	0.349
	60.	0.02	182.7	1.27	54.15	78.57	0.3226	0.3362	-5.33	-3.00	-0.0844	0.7203	0.0203	0.0229	18.1146	11.823
	60.	0.05	181.6	1.85	53.39	78.12	0.3242	0.3367	-6.10	-3.45	-0.0939	0.7226	0.0224	0.0235	19.0290	12.261
	60.	0.10	180.2	2.57	53.84	78.39	0.3197	0.3303	-5.65	-3.19	-0.0923	0.7994	0.0179	0.0171	15.0303	9.693

Exhibit A-8 (continued)

60.	0.20	173.7	3.40	55.89	79.52	0.3102	0.3196	-3.69	-2.06	-0.0623	0.9243	0.0034	0.0063	7.0974	4.465
60.	0.50	176.6	4.55	58.42	80.99	0.3027	0.3129	-1.06	-0.58	-0.0196	0.9836	0.0009	-0.0004	1.0052	0.634
60.	0.80	175.9	4.90	59.16	81.40	0.3018	0.3129	-0.32	-0.18	-0.0063	0.9905	0.0001	-0.0004	0.8828	0.557
90.	0.02	183.0	1.10	54.57	78.81	0.3212	0.3343	-4.91	-2.76	-0.0775	0.7333	0.0194	0.0216	17.0819	11.114
90.	0.05	182.0	1.62	53.89	78.42	0.3225	0.3353	-5.60	-3.16	-0.0896	0.7363	0.0207	0.0220	17.8149	11.593
90.	0.10	180.9	2.21	54.51	78.78	0.3176	0.3287	-4.98	-2.80	-0.0814	0.8175	0.0159	0.0154	13.4220	8.617
90.	0.20	179.6	2.93	56.24	79.77	0.3093	0.3191	-3.23	-1.81	-0.0551	0.9309	0.0076	0.0053	6.8944	4.017
90.	0.50	177.7	3.94	58.55	81.06	0.3026	0.3130	-0.93	-0.51	-0.0172	0.9877	0.0003	-0.0003	0.9454	0.724
90.	0.80	177.2	4.24	59.20	81.42	0.3018	0.3129	-0.28	-0.15	-0.0055	0.9995	0.0001	-0.0003	0.2916	0.247
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE															
90.	0.24	179.2	3.13	56.70	80.03	0.3076	0.3172	-2.73	-1.54	-0.0473	0.9520	0.0053	0.0040	4.9068	3.033

Exhibit A-8 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
	30.	0.02	181.0	2.15	56.01	79.64	0.3236	0.3376	-7.93	-4.34	-0.1183	0.6959	0.0255	0.0266	22.6154	14.439
	30.	0.05	179.5	2.98	54.92	79.01	0.3252	0.3376	-9.07	-4.96	-0.1370	0.6993	0.0272	0.0267	23.3068	14.896
	30.	0.10	177.2	4.20	54.96	79.04	0.3212	0.3313	-9.04	-4.94	-0.1362	0.7672	0.0231	0.0204	19.6837	12.547
	30.	0.20	174.1	5.91	57.35	80.39	0.3098	0.3185	-6.64	-3.58	-0.1053	0.9043	0.0113	0.0075	10.2021	6.556
	30.	0.50	170.4	7.83	62.00	82.93	0.2939	0.3098	-1.99	-1.05	-0.0349	1.0016	0.0009	-0.0011	1.7078	1.427
	30.	0.80	170.0	8.12	63.33	83.63	0.2930	0.3101	-0.67	-0.35	-0.0116	1.0019	-0.0001	-0.0003	0.6818	0.563
	45.	0.02	182.3	1.46	57.29	80.36	0.3297	0.3353	-6.70	-3.62	-0.0932	0.7070	0.0226	0.0240	20.4505	13.243
	45.	0.05	181.1	2.13	56.22	79.76	0.3227	0.3366	-7.77	-4.22	-0.1156	0.7056	0.0246	0.0257	21.7312	14.014
	45.	0.10	179.3	3.06	56.40	79.86	0.3188	0.3306	-7.60	-4.12	-0.1154	0.7756	0.0207	0.0197	18.0571	11.693
	45.	0.20	177.4	4.11	59.01	81.31	0.3075	0.3173	-4.99	-2.67	-0.0735	0.9133	0.0093	0.0069	8.3914	5.295
	45.	0.50	174.7	5.54	62.51	83.20	0.2989	0.3103	-1.49	-0.78	-0.0252	1.0093	0.0003	-0.0007	1.2949	1.054
	45.	0.80	174.0	5.97	63.50	83.72	0.2980	0.3104	-0.50	-0.26	-0.0083	1.0013	-0.0000	-0.0006	0.4607	0.397
	60.	0.02	182.5	1.18	57.99	80.75	0.3187	0.3342	-6.01	-3.23	-0.0874	0.7311	0.0206	0.0232	18.9690	12.334
	60.	0.05	181.3	1.75	57.12	80.26	0.3202	0.3347	-6.83	-3.71	-0.1016	0.7235	0.0222	0.0237	19.8979	12.921
	60.	0.10	180.4	2.47	57.61	80.54	0.3157	0.3282	-6.38	-3.44	-0.0963	0.8014	0.0176	0.0172	15.9577	9.969
	60.	0.20	178.8	3.33	59.81	81.75	0.3062	0.3172	-4.19	-2.23	-0.0655	0.9271	0.0092	0.0063	7.3211	4.602
	60.	0.50	176.6	4.52	62.75	83.33	0.2988	0.3105	-1.25	-0.65	-0.0211	0.9993	0.0003	-0.0005	1.0057	0.852
	60.	0.80	176.0	4.87	63.53	83.76	0.2980	0.3105	-0.42	-0.22	-0.0073	1.0010	-0.0000	-0.0005	0.3815	0.362
	90.	0.02	183.1	1.02	58.46	81.01	0.3173	0.3328	-5.54	-2.97	-0.0802	0.7335	0.0192	0.0219	17.8290	11.550
	90.	0.05	182.2	1.53	57.69	80.58	0.3166	0.3332	-6.31	-3.40	-0.0920	0.7370	0.0205	0.0223	18.6331	12.040
	90.	0.10	181.1	2.13	58.37	80.96	0.3137	0.3263	-5.62	-3.01	-0.0844	0.8193	0.0156	0.0156	14.0603	8.924
	90.	0.20	179.7	2.87	60.31	82.02	0.3054	0.3167	-3.69	-1.96	-0.0574	0.9333	0.0073	0.0053	6.6033	4.142
	90.	0.50	177.8	3.91	62.90	83.49	0.2983	0.3106	-1.10	-0.57	-0.0183	0.9996	0.0007	-0.0006	0.2709	0.772
	90.	0.80	177.2	4.22	63.63	83.79	0.2981	0.3105	-0.37	-0.19	-0.0064	1.0000	0.0000	-0.0006	0.3333	0.283
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.24	179.3	3.07	60.83	82.30	0.3036	0.3143	-3.17	-1.67	-0.0499	0.9545	0.0056	0.0039	5.0454	3.187

Exhibit A-8 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	DRATIO	DELX	DELY	E(LUV)	E(LAB)
45.															
	30.	15.	2.95	38.47	68.39	0.3210	0.3429	-3.13	-2.23	-0.0547	0.3089	0.0602	0.0719	49.4429	31.6354
	30.	30.	1.41	25.75	57.83	0.3229	0.3419	1.55	1.51	0.0085	0.2390	0.0593	0.0831	46.3672	30.0879
	30.	45.	0.83	21.09	53.03	0.3252	0.3439	3.31	3.82	0.2127	0.2056	0.0752	0.0892	44.0224	30.2723
	30.	60.	0.60	18.90	50.60	0.3281	0.3461	4.13	5.26	0.3072	0.1652	0.0793	0.0933	42.7406	30.1171
	30.	75.	0.44	17.85	49.35	0.3301	0.3477	4.51	6.04	0.3653	0.1752	0.0819	0.0953	42.1832	30.1580
	30.	90.	0.39	17.53	48.96	0.3309	0.3483	4.62	6.29	0.3856	0.1716	0.0823	0.0967	42.0461	30.1997
	45.	15.	2.10	33.82	63.65	0.3074	0.3297	-2.79	-1.93	-0.0473	0.3905	0.0467	0.0537	40.7197	25.0238
	45.	30.	1.04	25.11	57.22	0.3057	0.3255	0.91	0.89	0.0604	0.3264	0.0530	0.0667	37.4226	24.7366
	45.	45.	0.63	20.09	51.97	0.3075	0.3259	2.31	2.71	0.1539	0.2639	0.0574	0.0713	35.1376	24.0012
	45.	60.	0.51	17.73	49.21	0.3093	0.3270	2.97	3.86	0.2257	0.2373	0.0605	0.0743	33.8176	23.6663
	45.	75.	0.42	16.62	47.82	0.3106	0.3279	3.28	4.50	0.2707	0.2364	0.0623	0.0760	33.1436	23.5343
	45.	90.	0.39	16.29	47.39	0.3110	0.3282	3.37	4.71	0.2860	0.2527	0.0629	0.0766	32.9375	23.5026
	60.	15.	1.73	39.10	68.85	0.3002	0.3217	-2.50	-1.77	-0.0419	0.4463	0.0394	0.0507	35.5270	22.5516
	60.	30.	0.88	24.87	56.98	0.2972	0.3161	0.67	0.66	0.0435	0.3829	0.0445	0.0573	32.3790	21.3363
	60.	45.	0.60	19.65	51.47	0.2983	0.3159	1.87	2.21	0.1271	0.3463	0.0483	0.0612	30.2428	20.6103
	60.	60.	0.47	17.20	48.55	0.2997	0.3163	2.44	3.21	0.1876	0.3244	0.0509	0.0637	29.0225	20.2556
	60.	75.	0.41	16.03	47.08	0.3007	0.3171	2.71	3.77	0.2256	0.3134	0.0524	0.0652	28.3730	20.0297
	60.	90.	0.39	15.71	46.63	0.3010	0.3173	2.79	3.95	0.2385	0.3083	0.0529	0.0657	28.1707	20.0563
	90.	15.	1.51	39.31	69.00	0.2955	0.3163	-2.29	-1.62	-0.0389	0.4334	0.0343	0.0453	31.9992	20.2656
	90.	30.	0.78	24.74	56.86	0.2918	0.3099	0.54	0.53	0.0416	0.4266	0.0391	0.0510	29.0127	19.0835
	90.	45.	0.55	19.39	51.18	0.2925	0.3092	1.62	1.92	0.1109	0.3893	0.0425	0.0545	27.0649	18.8026
	90.	60.	0.45	16.89	48.16	0.2936	0.3096	2.12	2.81	0.1643	0.3671	0.0443	0.0563	25.8366	18.0436
	90.	75.	0.41	15.71	46.63	0.2944	0.3100	2.37	3.31	0.1973	0.3547	0.0461	0.0581	25.2756	17.8379
	90.	90.	0.39	15.35	46.15	0.2947	0.3102	2.44	3.43	0.2093	0.3507	0.0466	0.0585	25.0843	17.8421
90.															
	30.	15.	2.95	22.95	55.06	0.3063	0.3292	-3.38	-3.33	-0.1041	0.3273	0.0566	0.0726	42.7843	28.1111
	30.	30.	1.41	15.01	45.69	0.3060	0.3271	-0.37	-0.51	0.0033	0.2603	0.0638	0.0825	38.6439	26.6093
	30.	45.	0.83	12.09	41.40	0.3086	0.3284	0.77	1.25	0.0975	0.2279	0.0689	0.0880	36.0527	25.8718
	30.	60.	0.60	10.71	39.13	0.3111	0.3304	1.31	2.34	0.1683	0.2059	0.0725	0.0918	34.4003	25.4510
	30.	75.	0.44	10.05	37.98	0.3129	0.3319	1.55	2.93	0.2123	0.1965	0.0743	0.0943	33.7564	25.3300
	30.	90.	0.39	9.85	37.62	0.3136	0.3326	1.62	3.12	0.2276	0.1926	0.0756	0.0952	33.5556	25.3203
	45.	15.	2.10	23.53	55.65	0.2932	0.3155	-2.80	-2.73	-0.0833	0.4091	0.0434	0.0588	35.2396	23.1039
	45.	30.	1.04	14.96	45.62	0.2903	0.3108	-0.43	-0.58	-0.0021	0.3493	0.0482	0.0654	31.3676	21.5255
	45.	45.	0.63	11.80	40.93	0.2914	0.3097	0.48	0.78	0.0688	0.3162	0.0517	0.0693	29.7660	20.5925
	45.	60.	0.51	10.31	38.44	0.2928	0.3104	0.91	1.65	0.1232	0.2960	0.0542	0.0719	27.2367	20.0550
	45.	75.	0.42	9.61	37.17	0.2938	0.3111	1.11	2.13	0.1572	0.2843	0.0557	0.0734	26.4394	19.5017
	45.	90.	0.39	9.40	36.78	0.2941	0.3113	1.17	2.28	0.1688	0.2812	0.0562	0.0739	26.1927	19.7285
	60.	15.	1.73	23.88	56.01	0.2863	0.3073	-2.45	-2.38	-0.0720	0.4651	0.0365	0.0506	30.7338	20.1156
	60.	30.	0.83	14.97	45.64	0.2824	0.3004	-0.41	-0.56	-0.0036	0.4091	0.0402	0.0559	27.1268	18.6543
	60.	45.	0.60	11.68	40.75	0.2827	0.2994	0.37	0.60	0.0562	0.3762	0.0430	0.0590	24.7507	17.7059
	60.	60.	0.47	10.14	38.13	0.2837	0.2997	0.74	1.34	0.1021	0.3557	0.0451	0.0611	23.3361	17.1796
	60.	75.	0.41	9.41	36.89	0.2844	0.3000	0.91	1.76	0.1310	0.3443	0.0463	0.0624	22.5339	16.9177
	60.	90.	0.39	9.19	36.39	0.2847	0.3001	0.96	1.89	0.1408	0.3407	0.0467	0.0623	22.3477	16.8385
	90.	15.	1.51	24.12	56.25	0.2819	0.3018	-2.21	-2.14	-0.0644	0.5064	0.0321	0.0451	27.6631	18.0860
	90.	30.	0.78	14.99	45.66	0.2773	0.2941	-0.39	-0.53	-0.0040	0.4532	0.0352	0.0496	24.2048	16.6973
	90.	45.	0.55	11.62	40.65	0.2773	0.2927	0.30	0.50	0.0437	0.4207	0.0376	0.0523	22.1007	15.8283
	90.	60.	0.45	10.04	37.95	0.2780	0.2927	0.63	1.16	0.0893	0.4001	0.0394	0.0541	20.7037	15.3089
	90.	75.	0.41	9.29	36.58	0.2786	0.2929	0.79	1.53	0.1143	0.3886	0.0403	0.0552	20.0267	15.0563
	90.	90.	0.39	9.07	36.16	0.2788	0.2930	0.84	1.66	0.1235	0.3849	0.0409	0.0556	19.8563	14.9791

Exhibit A-8 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.															
	30.	15.	2.93	25.56	57.65	0.3033	0.3285	-4.93	-4.46	-0.1324	0.3304	0.0353	0.0733	46.0750	29.9897
	30.	30.	1.41	16.43	47.57	0.3021	0.3257	-1.43	-1.79	-0.0443	0.3673	0.0419	0.0323	41.7657	28.4226
	30.	45.	0.88	13.05	42.88	0.3041	0.3268	-0.09	-0.14	0.0023	0.3353	0.0365	0.0331	38.7095	27.2224
	30.	60.	0.60	11.46	40.39	0.3064	0.3287	0.53	0.89	0.0205	0.2155	0.0409	0.0913	36.9203	26.7363
	30.	75.	0.44	10.70	39.11	0.3082	0.3302	0.82	1.44	0.1263	0.2369	0.0721	0.0943	36.1781	26.5516
	30.	90.	0.39	10.47	38.71	0.3088	0.3309	0.90	1.62	0.1333	0.1999	0.0729	0.0952	35.9547	26.5229
	45.	15.	2.10	26.50	58.54	0.2901	0.3142	-3.99	-3.56	-0.1042	0.4140	0.0424	0.0590	37.8520	24.5782
	45.	30.	1.04	16.63	47.82	0.2865	0.3089	-1.23	-1.54	-0.0376	0.3536	0.0463	0.0651	33.6721	22.6501
	45.	45.	0.63	12.97	42.76	0.2870	0.3074	-0.18	-0.26	0.0206	0.3274	0.0494	0.0697	30.8533	21.6611
	45.	60.	0.51	11.25	40.04	0.2882	0.3079	0.32	0.54	0.0652	0.3079	0.0516	0.0711	29.1902	21.0835
	45.	75.	0.42	10.44	38.66	0.2890	0.3085	0.56	0.99	0.0931	0.2969	0.0530	0.0726	28.3193	20.7177
	45.	90.	0.39	10.20	38.23	0.2893	0.3087	0.63	1.14	0.1026	0.2933	0.0534	0.0731	28.0493	20.6246
	60.	15.	1.73	27.03	59.04	0.2832	0.3038	-3.46	-3.07	-0.0892	0.4706	0.0355	0.0506	32.9660	21.3616
	60.	30.	0.83	16.76	48.00	0.2786	0.2983	-1.09	-1.36	-0.0331	0.4196	0.0385	0.0554	29.0391	19.7155
	60.	45.	0.60	12.96	42.74	0.2786	0.2969	-0.19	-0.28	0.0160	0.3891	0.0409	0.0582	26.5252	18.6224
	60.	60.	0.47	11.17	39.91	0.2793	0.2970	0.24	0.41	0.0533	0.3697	0.0427	0.0601	24.9030	17.9282
	60.	75.	0.41	10.33	38.46	0.2798	0.2972	0.45	0.80	0.0775	0.3588	0.0438	0.0613	24.1754	17.6795
	60.	90.	0.39	10.08	38.02	0.2800	0.2973	0.51	0.92	0.0856	0.3552	0.0441	0.0616	23.9130	17.5818
	90.	15.	1.51	27.39	59.36	0.2789	0.2992	-3.10	-2.74	-0.0794	0.5124	0.0311	0.0450	29.6462	19.1927
	90.	30.	0.73	16.86	48.13	0.2737	0.2919	-0.99	-1.24	-0.0299	0.4643	0.0336	0.0490	26.0360	17.6345
	90.	45.	0.55	12.96	42.74	0.2733	0.2902	-0.13	-0.28	0.0135	0.4344	0.0357	0.0514	23.6713	16.9149
	90.	60.	0.45	11.13	39.84	0.2738	0.2899	0.20	0.34	0.0469	0.4152	0.0372	0.0531	22.2541	16.0263
	90.	75.	0.41	10.26	38.35	0.2742	0.2900	0.33	0.68	0.0679	0.4043	0.0381	0.0540	21.4929	15.7216
	90.	90.	0.39	10.00	37.89	0.2743	0.2900	0.44	0.80	0.0751	0.4003	0.0384	0.0544	21.2523	15.6274

Exhibit A-8 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
THETA = 45.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	95.44	93.21	0.3391	0.3497	-2.57	-1.02	-0.0249	0.9353	0.0072	0.0075	6.5556	4.5203
1.0	0.02	0.05	93.18	97.39	0.3450	0.3548	-5.74	-2.28	-0.0559	0.7847	0.0154	0.0154	14.0783	9.6034
1.0	0.02	0.10	92.76	97.13	0.3461	0.3554	-7.43	-2.94	-0.0718	0.7415	0.0194	0.0191	17.7471	11.8023
1.0	0.02	0.20	94.35	97.78	0.3432	0.3529	-7.71	-3.01	-0.0726	0.7314	0.0193	0.0199	18.6663	12.3253
1.0	0.02	0.50	96.56	98.66	0.3409	0.3516	-8.07	-3.10	-0.0733	0.7250	0.0201	0.0205	19.4053	12.7663
1.0	0.02	0.80	97.23	98.92	0.3409	0.3518	-8.16	-3.13	-0.0741	0.7257	0.0202	0.0206	19.4539	12.7959
1.0	0.05	0.05	94.55	97.85	0.3410	0.3509	-4.33	-1.73	-0.0426	0.8339	0.0113	0.0115	10.6141	7.0637
1.0	0.05	0.10	92.43	97.00	0.3456	0.3541	-7.77	-3.08	-0.0760	0.7659	0.0190	0.0178	17.0004	11.2326
1.0	0.05	0.20	93.45	97.41	0.3439	0.3524	-8.61	-3.38	-0.0825	0.7459	0.0205	0.0195	18.6044	12.3310
1.0	0.05	0.50	95.57	98.26	0.3419	0.3514	-9.06	-3.50	-0.0841	0.7365	0.0211	0.0204	19.3557	12.9670
1.0	0.05	0.80	96.21	98.52	0.3418	0.3517	-9.18	-3.53	-0.0846	0.7360	0.0211	0.0204	19.3749	13.0303
1.0	0.10	0.10	95.39	98.39	0.3363	0.3452	-4.31	-1.69	-0.0422	0.8330	0.0097	0.0089	8.9177	5.7849
1.0	0.10	0.20	94.51	97.84	0.3337	0.3461	-7.55	-2.95	-0.0739	0.8320	0.0153	0.0131	13.9502	8.9623
1.0	0.10	0.50	96.60	98.67	0.3370	0.3454	-8.03	-3.09	-0.0761	0.8174	0.0162	0.0143	15.1054	9.6839
1.0	0.10	0.80	97.23	98.92	0.3370	0.3457	-8.16	-3.12	-0.0767	0.8166	0.0163	0.0144	15.2256	9.7614
1.0	0.20	0.20	99.25	99.71	0.3279	0.3364	-2.81	-1.08	-0.0280	0.9563	0.0046	0.0034	4.2174	2.6550
1.0	0.20	0.50	99.45	99.79	0.3285	0.3365	-5.18	-1.97	-0.0509	0.9310	0.0077	0.0054	7.1596	4.4933
1.0	0.20	0.80	100.08	100.03	0.3286	0.3368	-5.31	-2.01	-0.0517	0.9299	0.0079	0.0055	7.3163	4.5975
1.0	0.50	0.50	100.83	101.46	0.3213	0.3310	-0.80	-0.30	-0.0084	0.9933	0.0005	-0.0001	0.5072	0.4292
1.0	0.50	0.80	103.90	101.49	0.3215	0.3311	-1.49	-0.56	-0.0156	0.9983	0.0003	-0.0002	1.0472	0.7037
1.0	0.80	0.80	105.15	101.96	0.3207	0.3311	-0.24	-0.09	-0.0026	1.0006	0.0000	-0.0002	0.1591	0.1341
0.3	0.02	0.02	34.82	65.64	0.3260	0.3364	-0.14	-0.11	-0.0027	0.8933	0.0063	0.0069	4.2479	2.8332
0.3	0.02	0.05	42.19	70.96	0.3220	0.3327	-0.69	-0.47	-0.0133	0.8993	0.0132	0.0140	9.6092	6.2973
0.3	0.02	0.10	51.84	77.21	0.3196	0.3319	-2.05	-1.21	-0.0337	0.7471	0.0177	0.0193	14.6272	9.4035
0.3	0.02	0.20	66.31	85.17	0.3199	0.3344	-4.14	-2.06	-0.0583	0.7225	0.0194	0.0216	18.0637	11.5339
0.3	0.02	0.50	87.34	94.89	0.3298	0.3450	-7.00	-2.88	-0.0694	0.7195	0.0202	0.0216	19.3143	12.7636
0.3	0.02	0.80	94.10	97.68	0.3360	0.3497	-7.83	-3.07	-0.0729	0.7227	0.0202	0.0210	19.6837	12.8313
0.3	0.05	0.05	42.36	71.14	0.3181	0.3236	-0.43	-0.29	-0.0039	0.8536	0.0094	0.0098	6.8427	4.4490
0.3	0.05	0.10	52.27	77.46	0.3177	0.3289	-1.63	-0.96	-0.0272	0.7844	0.0157	0.0163	12.7352	8.0663
0.3	0.05	0.20	66.29	85.16	0.3199	0.3333	-4.17	-2.07	-0.0547	0.7391	0.0193	0.0205	17.6061	11.1223
0.3	0.05	0.50	86.62	94.53	0.3307	0.3449	-7.72	-3.19	-0.0779	0.7284	0.0211	0.0215	20.2661	12.9344
0.3	0.05	0.80	93.17	97.30	0.3370	0.3496	-8.76	-3.44	-0.0823	0.7321	0.0212	0.0209	20.2107	13.0349
0.3	0.10	0.10	53.40	78.13	0.3088	0.3194	-0.49	-0.29	-0.0031	0.9053	0.0063	0.0063	5.5165	3.4123
0.3	0.10	0.20	67.72	85.88	0.3137	0.3256	-2.74	-1.35	-0.0371	0.8292	0.0132	0.0123	11.7619	7.2203
0.3	0.10	0.50	87.76	95.06	0.3257	0.3386	-6.58	-2.71	-0.0673	0.8073	0.0161	0.0152	15.3576	9.6542
0.3	0.10	0.80	94.23	97.73	0.3322	0.3435	-7.70	-3.02	-0.0744	0.8119	0.0163	0.0148	15.4477	9.8202
0.3	0.20	0.20	70.17	87.09	0.3035	0.3153	-0.28	-0.14	-0.0042	0.9614	0.0030	0.0025	2.5150	1.4742
0.3	0.20	0.50	90.60	96.25	0.3173	0.3294	-3.73	-1.52	-0.0469	0.9200	0.0077	0.0060	7.2100	4.3943
0.3	0.20	0.80	97.07	98.86	0.3239	0.3346	-4.85	-1.88	-0.0586	0.9244	0.0089	0.0069	7.4020	4.6446
0.3	0.50	0.50	94.29	97.73	0.3101	0.3236	-0.05	-0.02	-0.0010	0.9927	0.0005	0.0002	0.4896	0.2496
0.3	0.50	0.80	100.90	100.34	0.3169	0.3288	-1.03	-0.40	-0.0115	0.9920	0.0011	0.0001	1.0693	0.7035
0.3	0.80	0.80	101.93	100.74	0.3160	0.3287	-0.00	-0.00	-0.0003	0.9973	0.0001	0.0000	0.1214	0.0721
0.0	0.02	0.02	8.85	35.73	0.2763	0.2861	0.90	1.82	0.1144	0.8005	0.0097	0.0107	3.4823	2.9401

Exhibit A-8 (continued)

0.0	0.02	0.05	20.21	52.11	0.2840	0.2962	1.48	1.70	0.0023	0.7436	0.0140	0.0162	7.9151	5.4764
0.0	0.02	0.10	34.30	65.23	0.2931	0.3082	0.25	0.20	0.0139	0.7007	0.0173	0.0212	13.6341	8.7254
0.0	0.02	0.20	54.30	78.65	0.3041	0.3218	-2.61	-1.49	-0.0887	0.7064	0.0194	0.0230	18.0550	11.8517
0.0	0.02	0.50	83.39	93.19	0.3244	0.3418	-6.54	-2.78	-0.0673	0.7156	0.0202	0.0221	20.0165	12.8137
0.0	0.02	0.80	92.76	97.13	0.3339	0.3483	-7.68	-3.04	-0.0723	0.7212	0.0202	0.0212	19.7834	12.8519
0.0	0.05	0.05	19.99	51.86	0.2797	0.2910	1.27	1.46	0.0697	0.8115	0.0097	0.0110	5.3135	3.7609
0.0	0.05	0.10	35.06	65.82	0.2905	0.3043	1.01	0.79	0.0339	0.7459	0.0152	0.0173	11.2387	7.1193
0.0	0.05	0.20	54.65	78.86	0.3039	0.3205	-2.26	-1.29	-0.0336	0.7295	0.0191	0.0216	17.3447	10.7737
0.0	0.05	0.50	82.78	92.92	0.3253	0.3417	-7.14	-3.04	-0.0748	0.7234	0.0211	0.0220	20.4696	13.0026
0.0	0.05	0.80	91.87	96.77	0.3349	0.3487	-8.58	-3.40	-0.0829	0.7302	0.0212	0.0211	20.3160	13.1100
0.0	0.10	0.10	35.19	65.93	0.2814	0.2937	1.14	0.90	0.0345	0.8520	0.0061	0.0066	4.2391	2.7670
0.0	0.10	0.20	56.23	79.77	0.2975	0.3123	-0.68	-0.33	-0.0090	0.9033	0.0127	0.0134	11.1581	6.7595
0.0	0.10	0.50	83.97	93.44	0.3204	0.3353	-5.96	-2.53	-0.0637	0.8918	0.0162	0.0157	15.5099	9.6666
0.0	0.10	0.80	92.94	97.21	0.3301	0.3426	-7.51	-2.97	-0.0733	0.8906	0.0164	0.0150	15.5429	9.8369
0.0	0.20	0.20	57.71	80.60	0.2373	0.2613	0.80	0.45	0.0139	0.9509	0.0026	0.0024	2.0253	1.2566
0.0	0.20	0.50	86.81	94.66	0.3120	0.3261	-3.11	-1.30	-0.0347	0.9131	0.0073	0.0064	7.2906	4.3339
0.0	0.20	0.80	93.79	98.35	0.3218	0.3336	-4.66	-1.82	-0.0473	0.9216	0.0031	0.0060	7.5573	4.6643
0.0	0.50	0.50	99.20	96.08	0.3043	0.3201	0.28	0.12	0.0027	0.9833	0.0006	0.0004	0.4823	0.2915
0.0	0.50	0.80	99.61	99.35	0.3149	0.3278	-0.84	-0.32	-0.0096	0.9809	0.0012	0.0002	1.1103	0.6929
0.0	0.80	0.80	100.54	100.21	0.3139	0.3277	0.10	0.04	0.0003	0.9957	0.0002	0.0001	0.1653	0.0993

Exhibit A-8 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	91.53	96.63	0.3409	0.3512	-3.05	-1.24	-0.0310	0.8939	0.0073	0.0076	6.7379	4.5715
1.0	0.02	0.05	84.25	93.57	0.3491	0.3580	-6.53	-2.78	-0.0706	0.7786	0.0161	0.0159	13.9733	9.5505
1.0	0.02	0.10	77.65	90.63	0.3517	0.3588	-7.81	-3.46	-0.0897	0.7396	0.0202	0.0194	16.9289	11.5673
1.0	0.02	0.20	70.50	87.25	0.3477	0.3536	-6.88	-3.25	-0.0868	0.7369	0.0200	0.0193	16.6962	11.3626
1.0	0.02	0.50	59.92	81.81	0.3356	0.3424	-5.56	-2.94	-0.0814	0.7324	0.0200	0.0210	16.9295	11.2791
1.0	0.02	0.80	56.42	79.87	0.3284	0.3377	-5.16	-2.84	-0.0793	0.7298	0.0200	0.0217	17.2183	11.3343
1.0	0.05	0.05	85.75	94.21	0.3451	0.3541	-5.07	-2.13	-0.0544	0.8317	0.0121	0.0120	10.6659	7.2474
1.0	0.05	0.10	76.97	90.32	0.3519	0.3581	-8.49	-3.77	-0.0983	0.7598	0.0204	0.0187	16.8346	11.4610
1.0	0.05	0.20	69.41	86.72	0.3488	0.3534	-7.97	-3.78	-0.1020	0.7515	0.0211	0.0196	17.1333	11.6122
1.0	0.05	0.50	59.16	81.39	0.3364	0.3422	-6.33	-3.35	-0.0940	0.7452	0.0203	0.0207	17.2710	11.4263
1.0	0.05	0.80	55.75	79.49	0.3292	0.3375	-5.83	-3.21	-0.0910	0.7418	0.0203	0.0215	17.5568	11.4981
1.0	0.10	0.10	89.51	91.92	0.3424	0.3492	-4.95	-2.17	-0.0574	0.8756	0.0109	0.0093	9.2143	6.1769
1.0	0.10	0.20	69.84	86.93	0.3441	0.3474	-7.54	-3.58	-0.0983	0.8371	0.0165	0.0135	13.2491	8.8273
1.0	0.10	0.50	59.71	81.70	0.3314	0.3357	-5.77	-3.05	-0.0975	0.8283	0.0153	0.0143	13.0979	8.4739
1.0	0.10	0.80	56.35	79.83	0.3242	0.3310	-5.23	-2.87	-0.0933	0.8245	0.0153	0.0150	13.2330	8.5235
1.0	0.20	0.20	74.12	88.99	0.3331	0.3377	-3.26	-1.52	-0.0430	0.9593	0.0054	0.0039	4.5153	2.9024
1.0	0.20	0.50	61.44	82.63	0.3229	0.3263	-4.04	-2.11	-0.0633	0.9445	0.0073	0.0049	6.0436	3.9412
1.0	0.20	0.80	53.08	80.80	0.3158	0.3215	-3.50	-1.90	-0.0577	0.9393	0.0073	0.0055	6.1431	3.9262
1.0	0.50	0.50	64.52	84.25	0.3159	0.3209	-0.96	-0.49	-0.0157	1.0059	0.0003	-0.0005	0.6234	0.6029
1.0	0.50	0.80	60.40	82.07	0.3088	0.3154	-1.18	-0.64	-0.0203	1.0076	0.0004	-0.0007	0.8253	0.7850
1.0	0.80	0.80	61.29	82.55	0.3082	0.3156	-0.29	-0.16	-0.0052	1.0050	-0.0002	-0.0004	0.2722	0.2263
0.3	0.02	0.02	30.92	62.47	0.3293	0.3338	-0.62	-0.52	-0.0163	0.9036	0.0065	0.0063	4.0463	2.8210
0.3	0.02	0.05	33.17	64.32	0.3254	0.3340	-1.52	-1.21	-0.0415	0.8216	0.0132	0.0139	8.8556	5.9355
0.3	0.02	0.10	36.72	67.10	0.3200	0.3291	-2.43	-1.79	-0.0582	0.7633	0.0174	0.0190	12.9140	8.5455
0.3	0.02	0.20	42.46	71.21	0.3147	0.3259	-3.31	-2.21	-0.0667	0.7344	0.0189	0.0217	15.7239	10.2559
0.3	0.02	0.50	50.70	76.52	0.3164	0.3302	-4.49	-2.65	-0.0753	0.7243	0.0197	0.0227	17.4660	11.3403
0.3	0.02	0.80	53.29	78.07	0.3197	0.3335	-4.83	-2.76	-0.0774	0.7253	0.0193	0.0224	17.5016	11.4044
0.3	0.05	0.05	33.57	64.65	0.3217	0.3300	-1.12	-0.89	-0.0307	0.8729	0.0095	0.0099	6.4006	4.2975
0.3	0.05	0.10	36.81	67.16	0.3183	0.3262	-2.34	-1.73	-0.0572	0.8025	0.0156	0.0161	11.8042	7.6334
0.3	0.05	0.20	42.25	71.07	0.3146	0.3246	-3.52	-2.35	-0.0723	0.7543	0.0183	0.0205	15.2073	9.8392
0.3	0.05	0.50	50.20	76.21	0.3172	0.3300	-4.99	-2.96	-0.0851	0.7350	0.0206	0.0224	17.7730	11.4632
0.3	0.05	0.80	52.71	77.72	0.3206	0.3334	-5.41	-3.10	-0.0882	0.7359	0.0207	0.0222	17.8772	11.5757
0.3	0.10	0.10	38.02	68.06	0.3096	0.3169	-1.14	-0.83	-0.0282	0.9166	0.0070	0.0063	5.1210	3.2702
0.3	0.10	0.20	43.04	71.61	0.3085	0.3167	-2.73	-1.82	-0.0579	0.8477	0.0127	0.0125	10.1399	6.4239
0.3	0.10	0.50	50.87	76.62	0.3122	0.3203	-4.32	-2.55	-0.0753	0.8165	0.0155	0.0157	13.3223	8.4457
0.3	0.10	0.80	53.35	78.10	0.3157	0.3267	-4.77	-2.72	-0.0795	0.8171	0.0158	0.0156	13.5254	8.6127
0.3	0.20	0.20	45.04	72.94	0.2987	0.3064	-0.73	-0.48	-0.0163	0.9717	0.0029	0.0022	2.2272	1.3557
0.3	0.20	0.50	52.60	77.66	0.3038	0.3135	-2.59	-1.51	-0.0469	0.9300	0.0072	0.0059	6.0635	3.7593
0.3	0.20	0.80	55.08	79.10	0.3074	0.3171	-3.04	-1.72	-0.0526	0.9304	0.0075	0.0060	6.3793	3.9865
0.3	0.50	0.50	54.99	79.05	0.2970	0.3076	-0.20	-0.12	-0.0042	0.9975	0.0003	0.0000	0.3056	0.2075
0.3	0.50	0.80	57.39	80.42	0.3007	0.3110	-0.73	-0.41	-0.0133	0.9971	0.0008	-0.0001	0.8157	0.5268
0.3	0.80	0.80	58.06	80.79	0.2999	0.3110	-0.06	-0.03	-0.0012	0.9995	0.0000	-0.0001	0.0759	0.0609
0.0	0.02	0.02	4.94	26.60	0.2599	0.2647	0.43	1.26	0.0955	0.8159	0.0084	0.0101	2.2950	2.2032
0.0	0.02	0.05	11.27	40.08	0.2672	0.2751	0.64	1.09	0.0648	0.7577	0.0126	0.0158	6.0767	4.4683

Exhibit A-8 (continued)

0.0	0.02	0.10	19.18	50.94	0.2760	0.2878	-0.13	-0.15	0.0013	0.7194	0.0164	0.0213	11.4023	7.5683
0.0	0.02	0.20	30.45	62.07	0.2367	0.2823	-1.78	-1.49	-0.0462	0.7115	0.0183	0.0237	15.6881	10.0622
0.0	0.02	0.50	46.74	74.05	0.2965	0.3239	-4.03	-2.52	-0.0729	0.7177	0.0196	0.0231	17.2415	11.4029
0.0	0.02	0.80	51.95	77.27	0.3158	0.3316	-4.69	-2.72	-0.0766	0.7227	0.0198	0.0227	17.6899	11.4377
0.0	0.05	0.05	11.20	39.96	0.2532	0.2699	0.57	0.96	0.0560	0.8240	0.0036	0.0105	3.9774	2.9896
0.0	0.05	0.10	19.60	51.42	0.2734	0.2837	0.29	0.33	0.0204	0.7577	0.0133	0.0171	9.1833	6.0212
0.0	0.05	0.20	30.61	62.21	0.2864	0.3008	-1.62	-1.35	-0.0422	0.7273	0.0179	0.0221	14.9094	9.4706
0.0	0.05	0.50	46.36	73.80	0.3073	0.3237	-4.42	-2.76	-0.0802	0.7256	0.0204	0.0233	18.0571	11.5215
0.0	0.05	0.80	51.41	76.95	0.3167	0.3315	-5.23	-3.05	-0.0869	0.7325	0.0207	0.0226	18.0221	11.6154
0.0	0.10	0.10	19.81	51.66	0.2650	0.2729	0.50	0.57	0.0270	0.8907	0.0054	0.0064	3.2512	2.1903
0.0	0.10	0.20	31.56	63.91	0.2891	0.2922	-0.67	-0.56	-0.0168	0.8172	0.0117	0.0135	9.3690	5.8014
0.0	0.10	0.50	47.08	74.26	0.3024	0.3169	-3.70	-2.30	-0.0687	0.8061	0.0155	0.0164	13.5466	8.4852
0.0	0.10	0.80	52.06	77.34	0.3118	0.3248	-4.58	-2.66	-0.0777	0.8129	0.0153	0.0159	13.6611	8.6583
0.0	0.20	0.20	32.58	63.85	0.2707	0.2810	0.35	0.29	0.0109	0.9556	0.0023	0.0023	1.5231	0.9609
0.0	0.20	0.50	48.81	75.35	0.2942	0.3070	-1.97	-1.21	-0.0380	0.9176	0.0073	0.0063	6.2073	3.7663
0.0	0.20	0.80	53.79	78.36	0.3036	0.3151	-2.85	-1.64	-0.0502	0.9253	0.0076	0.0062	6.4045	4.0224
0.0	0.50	0.50	50.90	76.64	0.2974	0.3008	0.12	0.08	0.0021	0.9902	0.0005	0.0003	0.3307	0.2057
0.0	0.50	0.80	56.10	79.69	0.2970	0.3091	-0.54	-0.30	-0.0106	0.9911	0.0010	0.0002	0.8659	0.5650
0.0	0.80	0.80	56.68	80.02	0.2962	0.3090	0.04	0.02	0.0006	0.9963	0.0002	0.0001	0.1124	0.0633

Exhibit A-8 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 220.0
THETA = 135.

REFLECT	RP/RVO	RO/RVO	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	91.82	96.75	0.3402	0.3505	-3.09	-1.25	-0.0311	0.8343	0.0073	0.0076	6.7503	4.5740
1.0	0.02	0.05	84.90	93.35	0.3473	0.3563	-6.70	-2.81	-0.0708	0.7819	0.0159	0.0158	14.0144	9.5463
1.0	0.02	0.10	78.81	91.16	0.3497	0.3562	-8.04	-3.52	-0.0901	0.7624	0.0199	0.0195	17.1383	11.6463
1.0	0.02	0.20	72.46	88.20	0.3433	0.3502	-7.24	-3.36	-0.0877	0.7372	0.0199	0.0202	17.2355	11.6220
1.0	0.02	0.50	62.99	83.45	0.3302	0.3392	-6.09	-3.11	-0.0834	0.7315	0.0199	0.0215	17.3127	11.7214
1.0	0.02	0.80	59.83	81.76	0.3233	0.3350	-5.74	-3.03	-0.0817	0.7291	0.0198	0.0221	13.0904	11.7953
1.0	0.05	0.05	86.44	94.51	0.3433	0.3524	-5.16	-2.15	-0.0545	0.8349	0.0120	0.0119	10.6623	7.2144
1.0	0.05	0.10	78.16	90.36	0.3487	0.3553	-8.69	-3.62	-0.0984	0.7651	0.0199	0.0183	16.8323	11.4159
1.0	0.05	0.20	71.35	87.67	0.3442	0.3498	-8.34	-3.89	-0.1026	0.7533	0.0203	0.0197	17.0413	11.5214
1.0	0.05	0.50	62.17	83.02	0.3310	0.3389	-6.91	-3.54	-0.0961	0.7448	0.0207	0.0212	13.1220	11.6620
1.0	0.05	0.80	59.10	81.36	0.3241	0.3347	-6.47	-3.43	-0.0937	0.7416	0.0206	0.0219	13.0247	11.9403
1.0	0.10	0.10	81.81	92.50	0.3392	0.3463	-5.04	-2.18	-0.0571	0.8297	0.0105	0.0095	9.1150	6.0670
1.0	0.10	0.20	71.87	87.92	0.3392	0.3434	-7.82	-3.64	-0.0989	0.8312	0.0159	0.0134	13.3315	8.8040
1.0	0.10	0.50	62.81	83.36	0.3259	0.3322	-6.28	-3.20	-0.0890	0.8292	0.0156	0.0146	13.5275	8.7693
1.0	0.10	0.80	59.77	81.73	0.3191	0.3280	-5.80	-3.06	-0.0856	0.8250	0.0156	0.0152	13.6305	8.8472
1.0	0.20	0.20	76.38	90.04	0.3334	0.3336	-3.32	-1.51	-0.0421	0.9627	0.0050	0.0036	4.3605	2.8583
1.0	0.20	0.50	64.74	84.37	0.3173	0.3226	-4.34	-2.19	-0.0636	0.9456	0.0070	0.0050	6.2951	4.0253
1.0	0.20	0.80	61.71	82.77	0.3106	0.3183	-3.86	-2.02	-0.0590	0.9405	0.0071	0.0055	6.3763	4.0545
1.0	0.50	0.50	68.11	86.07	0.3185	0.3172	-0.98	-0.49	-0.0150	1.0063	0.0002	-0.0005	0.6573	0.5859
1.0	0.50	0.80	64.30	84.13	0.3038	0.3122	-1.27	-0.66	-0.0206	1.0033	0.0003	-0.0007	0.8270	0.7963
1.0	0.80	0.80	65.27	84.64	0.3033	0.3125	-0.30	-0.15	-0.0049	1.0051	-0.0002	-0.0004	0.2704	0.2218
0.3	0.02	0.02	31.20	62.71	0.3274	0.3370	-0.66	-0.55	-0.0189	0.9047	0.0064	0.0068	4.0794	2.8250
0.3	0.02	0.05	33.82	64.85	0.3219	0.3309	-1.64	-1.29	-0.0428	0.8242	0.0129	0.0133	8.0723	6.0270
0.3	0.02	0.10	37.39	67.97	0.3156	0.3254	-2.66	-1.92	-0.0602	0.7648	0.0171	0.0191	13.2990	8.7367
0.3	0.02	0.20	44.42	72.53	0.3098	0.3223	-3.67	-2.37	-0.0692	0.7347	0.0187	0.0220	16.4983	10.6166
0.3	0.02	0.50	53.77	78.35	0.3116	0.3274	-5.02	-2.85	-0.0789	0.7242	0.0195	0.0230	18.3170	11.7994
0.3	0.02	0.80	56.70	80.03	0.3150	0.3310	-5.40	-2.96	-0.0801	0.7251	0.0196	0.0228	18.3593	11.8601
0.3	0.05	0.05	34.25	65.19	0.3182	0.3268	-1.21	-0.94	-0.0315	0.8756	0.0092	0.0098	6.4505	4.2997
0.3	0.05	0.10	38.00	68.05	0.3136	0.3223	-2.55	-1.84	-0.0588	0.8957	0.0152	0.0160	11.5929	7.5146
0.3	0.05	0.20	44.19	72.38	0.3096	0.3209	-3.90	-2.52	-0.0748	0.7556	0.0184	0.0206	15.8734	10.1765
0.3	0.05	0.50	53.21	78.02	0.3123	0.3271	-5.58	-3.17	-0.0839	0.7355	0.0203	0.0223	18.6052	11.9009
0.3	0.05	0.80	56.05	79.66	0.3159	0.3308	-6.05	-3.32	-0.0912	0.7362	0.0203	0.0226	18.7247	12.0241
0.3	0.10	0.10	39.32	69.01	0.3051	0.3128	-1.23	-0.88	-0.0287	0.9193	0.0066	0.0066	5.0934	3.2826
0.3	0.10	0.20	45.08	72.97	0.3034	0.3127	-3.01	-1.94	-0.0594	0.8505	0.0122	0.0124	10.4215	6.5315
0.3	0.10	0.50	53.96	78.46	0.3073	0.3202	-4.83	-2.73	-0.0778	0.8173	0.0152	0.0158	13.8373	8.7409
0.3	0.10	0.80	56.76	80.06	0.3109	0.3240	-5.35	-2.92	-0.0822	0.8183	0.0156	0.0158	14.1156	8.9242
0.3	0.20	0.20	47.30	74.40	0.2938	0.3024	-0.79	-0.50	-0.0163	0.9733	0.0026	0.0021	2.1613	1.3134
0.3	0.20	0.50	55.90	79.57	0.2990	0.3102	-2.89	-1.62	-0.0483	0.9319	0.0069	0.0059	6.2511	3.8533
0.3	0.20	0.80	58.70	81.14	0.3027	0.3142	-3.41	-1.84	-0.0543	0.9322	0.0073	0.0060	6.5977	4.1021
0.3	0.50	0.50	58.57	81.07	0.2923	0.3043	-0.22	-0.12	-0.0041	0.9931	0.0003	-0.0000	0.2799	0.1965
0.3	0.50	0.80	61.29	82.55	0.2961	0.3081	-0.82	-0.44	-0.0141	0.9932	0.0007	-0.0001	0.8124	0.6021
0.3	0.80	0.80	62.04	82.95	0.2954	0.3081	-0.06	-0.03	-0.0012	0.9997	0.0000	-0.0001	0.0702	0.0504
0.0	0.02	0.02	5.22	27.41	0.2559	0.2612	0.38	1.09	0.0833	0.8245	0.0078	0.0097	2.2747	2.1337

Exhibit A-8 (continued)

0.0	0.02	0.05	11.92	41.13	0.2630	0.2717	0.52	0.85	0.0531	0.7656	0.0113	0.0154	6.2300	4.5053
0.0	0.02	0.10	20.35	52.27	0.2717	0.2846	-0.36	-0.40	-0.0069	0.7246	0.0157	0.0211	11.8414	7.8024
0.0	0.02	0.20	32.40	63.71	0.2825	0.2994	-2.14	-1.72	-0.0511	0.7140	0.0173	0.0237	16.3363	10.4330
0.0	0.02	0.50	49.82	75.98	0.3020	0.3213	-4.56	-2.72	-0.0751	0.7133	0.0193	0.0237	18.5741	11.8490
0.0	0.02	0.80	55.36	79.27	0.3112	0.3291	-5.26	-2.92	-0.0793	0.7223	0.0196	0.0231	18.4794	11.8906
0.0	0.05	0.05	11.88	41.07	0.2591	0.2665	0.48	0.78	0.0471	0.8311	0.0080	0.0103	4.0425	2.9701
0.0	0.05	0.10	20.79	52.75	0.2691	0.2803	0.08	0.09	0.0117	0.7644	0.0131	0.0168	9.4006	6.1435
0.0	0.05	0.20	32.55	63.83	0.2820	0.2978	-1.99	-1.59	-0.0478	0.7310	0.0174	0.0221	15.4962	9.7930
0.0	0.05	0.50	49.37	75.71	0.3028	0.3211	-5.00	-3.00	-0.0836	0.7279	0.0200	0.0235	18.8703	11.9547
0.0	0.05	0.80	54.75	78.92	0.3121	0.3290	-5.87	-3.28	-0.0901	0.7332	0.0204	0.0229	18.8595	12.0602
0.0	0.10	0.10	21.11	53.11	0.2610	0.2696	0.41	0.44	0.0221	0.8959	0.0050	0.0062	3.2774	2.1750
0.0	0.10	0.20	33.59	64.67	0.2758	0.2890	-0.95	-0.75	-0.0219	0.8222	0.0112	0.0133	9.6243	5.9410
0.0	0.10	0.50	50.17	76.19	0.2979	0.3140	-4.21	-2.51	-0.0719	0.8033	0.0151	0.0165	14.0973	8.7775
0.0	0.10	0.80	55.47	79.33	0.3072	0.3221	-5.15	-2.86	-0.0806	0.8145	0.0155	0.0161	14.2422	8.9620
0.0	0.20	0.20	34.84	65.65	0.2667	0.2779	0.29	0.23	0.0089	0.9584	0.0021	0.0022	1.4949	0.9280
0.0	0.20	0.50	52.11	77.36	0.2897	0.3040	-2.27	-1.34	-0.0402	0.9204	0.0070	0.0065	6.3869	3.8635
0.0	0.20	0.80	57.41	80.43	0.2991	0.3123	-3.21	-1.77	-0.0522	0.9275	0.0074	0.0062	6.7067	4.1412
0.0	0.50	0.50	54.48	73.76	0.2832	0.2979	0.11	0.06	0.0017	0.9911	0.0004	0.0003	0.3122	0.1856
0.0	0.50	0.80	60.00	81.86	0.2926	0.3062	-0.62	-0.34	-0.0112	0.9925	0.0009	0.0001	0.8549	0.5719
0.0	0.80	0.80	60.66	82.21	0.2918	0.3061	0.04	0.02	0.0005	0.9967	0.0001	0.0001	0.0996	0.0600

Exhibit A-8 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 220.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(350)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	20.	0.00	179.6	2.89	90.77	96.32	0.3544	0.3645	-14.38	-5.64	-0.1339	0.5869	0.0350	0.0333	31.6145	21.018
	20.	0.02	179.1	3.19	92.00	96.82	0.3493	0.3586	-13.20	-5.15	-0.1233	0.6574	0.0298	0.0274	27.0254	17.723
	20.	0.05	178.4	3.59	93.64	97.49	0.3432	0.3517	-11.60	-4.50	-0.1101	0.7415	0.0235	0.0209	21.4441	13.833
	20.	0.10	177.3	4.15	95.95	98.41	0.3359	0.3438	-9.37	-3.61	-0.0905	0.8389	0.0161	0.0125	14.7155	9.282
	20.	0.20	175.8	4.96	99.29	99.73	0.3278	0.3358	-6.14	-2.34	-0.0611	0.9383	0.0077	0.0044	7.1443	4.521
	20.	0.50	173.7	6.08	103.84	101.47	0.3213	0.3310	-1.73	-0.67	-0.0189	0.9909	0.0007	-0.0005	1.1971	0.969
	20.	0.80	173.1	6.42	105.16	101.96	0.3207	0.3311	-0.54	-0.20	-0.0058	1.0013	-0.0001	-0.0004	0.3722	0.311
	40.	0.00	180.7	2.34	83.21	93.11	0.3672	0.3695	-22.12	-8.91	-0.2145	0.5302	0.0473	0.0331	39.5192	26.216
	40.	0.02	179.7	3.33	85.03	93.90	0.3595	0.3617	-20.32	-8.13	-0.1933	0.6117	0.0396	0.0303	33.5486	21.995
	40.	0.05	176.2	4.77	87.49	94.95	0.3507	0.3530	-17.90	-7.10	-0.1763	0.7036	0.0306	0.0247	26.4148	16.982
	40.	0.10	172.6	6.68	90.94	96.39	0.3405	0.3435	-14.50	-5.63	-0.1449	0.8207	0.0203	0.0121	18.6980	11.621
	40.	0.20	167.6	9.41	95.97	98.42	0.3296	0.3345	-9.56	-3.63	-0.0930	0.9347	0.0092	0.0039	8.8487	5.554
	40.	0.50	160.7	13.11	102.84	101.09	0.3213	0.3301	-2.81	-1.06	-0.0303	1.0213	0.0006	-0.0014	1.3156	1.500
	40.	0.80	171.1	7.53	104.35	101.84	0.3206	0.3308	-0.66	-0.32	-0.0094	1.0027	-0.0002	-0.0007	0.6219	0.511
	60.	0.00	182.7	1.22	79.45	91.45	0.3697	0.3672	-26.00	-10.62	-0.2575	0.5279	0.0493	0.0350	49.8968	26.669
	60.	0.02	179.1	3.20	81.57	92.39	0.3613	0.3594	-23.90	-9.63	-0.2301	0.6110	0.0411	0.0279	34.1035	22.326
	60.	0.05	174.3	5.81	84.42	93.64	0.3517	0.3506	-21.08	-8.43	-0.2117	0.7093	0.0314	0.0192	26.8310	17.247
	60.	0.10	167.6	9.38	88.42	95.34	0.3409	0.3413	-17.11	-6.76	-0.1749	0.8236	0.0203	0.0099	18.2721	11.650
	60.	0.20	153.3	14.45	94.27	97.74	0.3294	0.3323	-11.32	-4.33	-0.1177	0.9337	0.0099	0.0016	9.1135	6.063
	60.	0.50	148.7	19.61	102.31	100.89	0.3210	0.3296	-3.37	-1.27	-0.0364	1.0033	0.0003	-0.0019	2.1206	1.895
	60.	0.80	171.1	7.50	104.68	101.78	0.3205	0.3306	-1.04	-0.39	-0.0112	1.0040	-0.0004	-0.0009	0.7693	0.631
	80.	0.00	183.1	1.02	77.66	90.63	0.3696	0.3652	-27.88	-11.47	-0.2785	0.5311	0.0492	0.0337	39.8934	26.283
	80.	0.02	177.7	3.96	79.91	91.65	0.3610	0.3574	-25.64	-10.45	-0.2576	0.6147	0.0406	0.0269	33.6029	22.029
	80.	0.05	170.5	7.81	82.94	92.99	0.3513	0.3489	-22.63	-9.12	-0.2291	0.7140	0.0303	0.0174	26.3070	17.175
	80.	0.10	160.8	13.03	87.29	94.83	0.3403	0.3399	-18.39	-7.29	-0.1933	0.8230	0.0193	0.0083	17.9463	11.564
	80.	0.20	147.1	20.49	93.43	97.41	0.3289	0.3319	-12.29	-4.73	-0.1324	0.9423	0.0033	0.0003	9.0209	6.020
	80.	0.50	143.9	19.49	102.04	100.78	0.3208	0.3293	-3.65	-1.33	-0.0394	1.0059	-0.0000	-0.0022	2.2216	1.989
	80.	0.80	171.2	7.49	104.59	101.75	0.3204	0.3305	-1.13	-0.42	-0.0122	1.0050	-0.0005	-0.0010	0.8353	0.678
	100.	0.00	183.3	2.54	76.78	90.23	0.3699	0.3641	-28.81	-11.89	-0.2937	0.5342	0.0484	0.0329	39.2155	26.047
	100.	0.02	178.2	6.38	79.10	91.29	0.3604	0.3564	-26.51	-10.84	-0.2660	0.6131	0.0399	0.0260	33.1547	21.799
	100.	0.05	168.8	11.44	82.21	92.68	0.3507	0.3480	-23.41	-9.45	-0.2354	0.7176	0.0301	0.0165	25.9166	17.003
	100.	0.10	151.1	18.32	86.60	94.57	0.3398	0.3391	-19.04	-7.56	-0.1952	0.8313	0.0192	0.0077	17.5919	11.783
	100.	0.20	134.8	27.11	93.02	97.24	0.3285	0.3314	-12.64	-4.91	-0.1320	0.9462	0.0073	-0.0001	8.5756	6.565
	100.	0.50	149.1	19.43	101.91	100.73	0.3206	0.3292	-3.69	-1.43	-0.0403	1.0077	-0.0002	-0.0024	2.3594	2.033
	100.	0.80	171.2	7.48	104.54	101.73	0.3203	0.3305	-1.19	-0.46	-0.0135	1.0058	-0.0006	-0.0010	0.8979	0.726
	120.	0.00	173.5	6.22	76.86	90.03	0.3685	0.3636	-29.28	-12.10	-0.2988	0.5367	0.0473	0.0321	38.8374	25.899
	120.	0.02	164.8	10.94	78.70	91.11	0.3599	0.3559	-26.93	-11.03	-0.2712	0.6209	0.0393	0.0254	32.7567	21.665
	120.	0.05	153.3	17.13	81.83	92.52	0.3502	0.3475	-23.80	-9.63	-0.2412	0.7206	0.0296	0.0160	25.5659	16.871
	120.	0.10	133.0	25.38	86.30	94.45	0.3394	0.3383	-19.37	-7.70	-0.1983	0.8343	0.0187	0.0073	17.3125	11.713
	120.	0.20	135.2	26.94	92.81	97.15	0.3282	0.3312	-12.87	-5.00	-0.1341	0.9489	0.0073	-0.0003	8.7255	6.569
	120.	0.50	149.1	19.40	101.83	100.70	0.3205	0.3291	-3.88	-1.46	-0.0415	1.0091	-0.0003	-0.0024	2.3975	2.084
	120.	0.80	171.2	7.47	104.52	101.72	0.3203	0.3305	-1.21	-0.45	-0.0123	1.0065	-0.0006	-0.0010	0.9287	0.721
	140.	0.00	161.5	12.72	76.14	89.94	0.3681	0.3633	-29.52	-12.21	-0.2953	0.5337	0.0474	0.0310	38.6062	25.711
	140.	0.02	151.2	18.23	78.59	91.02	0.3596	0.3557	-27.17	-11.13	-0.2731	0.6231	0.0389	0.0242	32.4945	21.494
	140.	0.05	142.9	22.77	81.68	92.44	0.3499	0.3474	-24.00	-9.71	-0.2429	0.7230	0.0292	0.0159	25.3882	16.762
	140.	0.10	133.3	25.23	86.15	94.38	0.3392	0.3387	-19.54	-7.77	-0.1997	0.8373	0.0184	0.0071	17.1811	11.659
	140.	0.20	135.3	26.86	92.71	97.11	0.3281	0.3311	-12.99	-5.05	-0.1359	0.9510	0.0073	-0.0004	8.6802	6.541
	140.	0.50	149.1	19.39	101.80	100.69	0.3205	0.3291	-3.93	-1.48	-0.0413	1.0102	-0.0004	-0.0023	2.3977	2.092

Exhibit A-8 (continued)

140.	0.80	171.2	7.47	104.50	101.71	0.3202	0.3305	-1.23	-0.46	-0.0129	1.0070	-0.0007	-0.0010	0.9382	0.720
160.	0.00	150.9	18.45	76.04	89.89	0.3679	0.3633	-29.64	-12.27	-0.2962	0.5603	0.0471	0.0317	38.4822	25.696
160.	0.02	147.5	20.29	78.41	90.97	0.3594	0.3556	-27.29	-11.16	-0.2739	0.6248	0.0385	0.0241	32.3818	21.607
160.	0.05	143.0	22.69	81.59	92.40	0.3498	0.3473	-24.10	-9.76	-0.2435	0.7249	0.0290	0.0158	25.1382	16.735
160.	0.10	138.4	25.17	86.08	94.35	0.3390	0.3386	-19.62	-7.81	-0.2003	0.8392	0.0182	0.0071	17.0102	11.643
160.	0.20	135.4	26.83	92.66	97.09	0.3280	0.3310	-13.05	-5.07	-0.1354	0.9527	0.0071	-0.0005	8.5573	6.583
160.	0.50	149.1	19.38	101.78	100.68	0.3204	0.3291	-3.95	-1.49	-0.0419	1.0111	-0.0003	-0.0025	2.4005	2.065
160.	0.80	171.2	7.47	104.50	101.71	0.3202	0.3305	-1.24	-0.46	-0.0130	1.0075	-0.0007	-0.0010	0.9464	0.733
180.	0.00	150.9	18.41	76.00	89.87	0.3678	0.3632	-29.71	-12.30	-0.2965	0.5615	0.0470	0.0317	38.3287	25.591
180.	0.02	147.5	20.26	78.36	90.95	0.3593	0.3556	-27.34	-11.21	-0.2742	0.6262	0.0383	0.0241	32.2387	21.527
180.	0.05	143.1	22.66	81.55	92.38	0.3497	0.3473	-24.16	-9.78	-0.2438	0.7263	0.0288	0.0157	25.0266	16.691
180.	0.10	138.5	25.14	86.05	94.34	0.3389	0.3386	-19.67	-7.83	-0.2006	0.8407	0.0181	0.0071	16.9261	11.601
180.	0.20	135.4	26.81	92.63	97.08	0.3279	0.3310	-13.09	-5.09	-0.1356	0.9541	0.0070	-0.0005	8.5106	6.569
180.	0.50	149.1	19.38	101.77	100.68	0.3204	0.3290	-3.96	-1.49	-0.0419	1.0117	-0.0003	-0.0025	2.4004	2.066
180.	0.80	171.2	7.47	104.49	101.71	0.3202	0.3305	-1.24	-0.46	-0.0130	1.0078	-0.0007	-0.0010	0.9509	0.734
200.	0.00	151.0	18.39	75.98	89.86	0.3677	0.3632	-29.74	-12.31	-0.2966	0.5625	0.0469	0.0317	38.2770	25.570
200.	0.02	147.5	20.25	78.34	90.94	0.3592	0.3556	-27.37	-11.22	-0.2743	0.6272	0.0384	0.0241	32.1763	21.506
200.	0.05	143.1	22.65	81.54	92.38	0.3496	0.3473	-24.18	-9.79	-0.2439	0.7275	0.0287	0.0157	25.0462	16.672
200.	0.10	138.5	25.13	86.03	94.33	0.3389	0.3386	-19.69	-7.84	-0.2006	0.8419	0.0180	0.0071	16.9031	11.583
200.	0.20	135.4	26.81	92.62	97.08	0.3279	0.3310	-13.10	-5.09	-0.1356	0.9551	0.0070	-0.0005	8.5039	6.555
200.	0.50	149.2	19.38	101.77	100.68	0.3204	0.3290	-3.97	-1.50	-0.0419	1.0123	-0.0003	-0.0025	2.4005	2.065
200.	0.80	171.2	7.47	104.49	101.71	0.3202	0.3305	-1.24	-0.46	-0.0130	1.0081	-0.0007	-0.0010	0.9532	0.735
210.	0.00	151.0	18.39	75.97	89.86	0.3677	0.3632	-29.75	-12.31	-0.2966	0.5629	0.0469	0.0317	38.2554	25.564
210.	0.02	147.5	20.25	78.34	90.94	0.3592	0.3556	-27.38	-11.22	-0.2743	0.6276	0.0384	0.0241	32.1663	21.500
210.	0.05	143.1	22.64	81.53	92.38	0.3496	0.3473	-24.19	-9.79	-0.2439	0.7279	0.0287	0.0157	25.0323	16.666
210.	0.10	138.5	25.13	86.03	94.33	0.3389	0.3386	-19.69	-7.84	-0.2006	0.8423	0.0180	0.0071	16.8916	11.574
210.	0.20	135.4	26.81	92.62	97.08	0.3279	0.3310	-13.11	-5.09	-0.1356	0.9555	0.0070	-0.0005	8.4762	6.549
210.	0.50	149.2	19.38	101.77	100.68	0.3204	0.3290	-3.97	-1.50	-0.0419	1.0125	-0.0003	-0.0025	2.3999	2.065
210.	0.80	171.2	7.47	104.49	101.71	0.3202	0.3305	-1.25	-0.47	-0.0130	1.0082	-0.0007	-0.0010	0.9537	0.735
215.	0.00	151.0	18.39	75.97	89.86	0.3677	0.3632	-29.75	-12.31	-0.2966	0.5630	0.0469	0.0317	38.2505	25.562
215.	0.02	147.5	20.24	78.34	90.94	0.3592	0.3556	-27.38	-11.23	-0.2743	0.6278	0.0384	0.0241	32.1594	21.498
215.	0.05	143.1	22.64	81.53	92.38	0.3496	0.3473	-24.19	-9.79	-0.2439	0.7281	0.0287	0.0157	25.0283	16.665
215.	0.10	138.5	25.13	86.03	94.33	0.3389	0.3386	-19.70	-7.84	-0.2006	0.8425	0.0180	0.0071	16.8876	11.569
215.	0.20	135.4	26.81	92.62	97.08	0.3279	0.3310	-13.11	-5.10	-0.1356	0.9557	0.0070	-0.0005	8.4747	6.495
215.	0.50	149.2	19.38	101.77	100.68	0.3204	0.3290	-3.97	-1.50	-0.0419	1.0125	-0.0003	-0.0025	2.3987	2.065
215.	0.80	171.2	7.47	104.49	101.71	0.3202	0.3305	-1.25	-0.47	-0.0130	1.0082	-0.0007	-0.0010	0.9539	0.736
218.	0.00	151.0	18.39	75.97	89.86	0.3677	0.3632	-29.75	-12.31	-0.2966	0.5631	0.0469	0.0317	38.2484	25.561
218.	0.02	147.5	20.24	78.34	90.94	0.3592	0.3556	-27.38	-11.23	-0.2743	0.6279	0.0384	0.0241	32.1574	21.497
218.	0.05	143.1	22.64	81.53	92.38	0.3496	0.3473	-24.19	-9.79	-0.2439	0.7282	0.0287	0.0157	25.0263	16.664
218.	0.10	138.5	25.13	86.03	94.33	0.3389	0.3386	-19.70	-7.84	-0.2006	0.8426	0.0180	0.0070	16.8760	11.569
218.	0.20	135.4	26.81	92.62	97.08	0.3279	0.3310	-13.11	-5.10	-0.1356	0.9558	0.0070	-0.0005	8.4705	6.495
218.	0.50	149.2	19.38	101.77	100.68	0.3204	0.3290	-3.97	-1.50	-0.0419	1.0126	-0.0003	-0.0025	2.3986	2.065
218.	0.80	171.2	7.47	104.49	101.71	0.3202	0.3305	-1.25	-0.47	-0.0130	1.0082	-0.0007	-0.0010	0.9540	0.736
219.	0.00	151.0	18.39	75.97	89.86	0.3677	0.3632	-29.75	-12.31	-0.2966	0.5631	0.0469	0.0317	38.2478	25.561
219.	0.02	147.5	20.24	78.34	90.94	0.3592	0.3556	-27.38	-11.23	-0.2743	0.6279	0.0384	0.0241	32.1567	21.497
219.	0.05	143.1	22.64	81.53	92.38	0.3496	0.3473	-24.19	-9.79	-0.2439	0.7282	0.0287	0.0157	25.0258	16.664
219.	0.10	138.5	25.13	86.03	94.33	0.3389	0.3386	-19.70	-7.84	-0.2006	0.8426	0.0180	0.0070	16.8755	11.569
219.	0.20	135.4	26.81	92.62	97.03	0.3279	0.3310	-13.11	-5.10	-0.1356	0.9558	0.0070	-0.0005	8.4702	6.495
219.	0.50	149.2	19.38	101.77	100.68	0.3204	0.3290	-3.97	-1.50	-0.0419	1.0126	-0.0003	-0.0025	2.3986	2.065
219.	0.80	171.2	7.47	104.49	101.71	0.3202	0.3305	-1.25	-0.47	-0.0130	1.0082	-0.0007	-0.0010	0.9541	0.736

Exhibit A-8 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 220.0

THETA	LENGTH	RP/RV0	RV REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
90.															
	20.	0.00	180.1	2.67	50.74	76.54	0.3367	0.3493	-8.76	-5.04	-0.1414	0.5396	0.0346	0.0361	28.1153	18.611
	20.	0.02	179.5	2.99	51.47	76.98	0.3314	0.3427	-8.03	-4.60	-0.1303	0.6610	0.0292	0.0295	23.9262	15.689
	20.	0.05	178.7	3.41	52.44	77.56	0.3251	0.3351	-7.06	-4.02	-0.1163	0.7461	0.0229	0.0218	18.6581	12.165
	20.	0.10	177.6	4.00	53.81	78.37	0.3177	0.3264	-5.70	-3.22	-0.0957	0.8442	0.0154	0.0132	12.7022	8.114
	20.	0.20	176.0	4.86	55.78	79.51	0.3096	0.3177	-3.73	-2.03	-0.0667	0.9469	0.0072	0.0045	6.0507	3.459
	20.	0.50	173.8	6.05	58.45	81.01	0.3032	0.3126	-1.03	-0.59	-0.0209	1.0018	0.0006	-0.0006	0.9667	0.595
	20.	0.80	173.1	6.41	59.22	81.43	0.3026	0.3123	-0.32	-0.18	-0.0062	1.0027	-0.0001	-0.0006	0.3214	0.274
	40.	0.00	182.1	1.54	46.06	73.61	0.3483	0.3546	-13.44	-7.98	-0.2267	0.5365	0.0365	0.0416	34.7251	22.975
	40.	0.02	180.1	2.66	47.16	74.32	0.3409	0.3459	-12.35	-7.27	-0.2096	0.6196	0.0336	0.0337	29.2922	19.105
	40.	0.05	177.3	4.14	48.64	75.23	0.3318	0.3363	-10.87	-6.34	-0.1864	0.7131	0.0293	0.0239	22.8302	14.711
	40.	0.10	173.6	6.17	50.71	76.53	0.3216	0.3259	-8.80	-5.06	-0.1533	0.8312	0.0192	0.0126	15.3393	9.841
	40.	0.20	168.2	9.09	53.73	78.32	0.3169	0.3161	-5.79	-3.27	-0.1037	0.9443	0.0083	0.0029	7.3916	4.845
	40.	0.50	160.9	13.02	57.83	80.66	0.3039	0.3116	-1.70	-0.94	-0.0321	1.0067	0.0003	-0.0016	1.4078	1.000
	40.	0.80	171.1	7.52	59.02	81.32	0.3025	0.3124	-0.52	-0.23	-0.0099	1.0033	-0.0003	-0.0003	0.5468	0.482
	60.	0.00	183.6	-0.31	43.74	72.08	0.3598	0.3520	-15.77	-9.51	-0.2722	0.5373	0.0433	0.0527	35.1606	23.215
	60.	0.02	181.6	1.81	45.02	72.93	0.3421	0.3431	-14.50	-8.66	-0.2517	0.6229	0.0396	0.0299	29.5366	19.203
	60.	0.05	176.5	4.62	46.74	74.04	0.3323	0.3334	-12.78	-7.55	-0.2233	0.7236	0.0293	0.0202	22.9366	14.873
	60.	0.10	169.4	8.45	49.15	75.57	0.3215	0.3233	-10.37	-6.03	-0.1841	0.8336	0.0190	0.0101	15.3509	10.004
	60.	0.20	159.4	13.65	52.67	77.70	0.3104	0.3142	-6.85	-3.90	-0.1245	0.9323	0.0073	0.0010	7.4241	5.053
	60.	0.50	143.9	19.52	57.50	80.48	0.3026	0.3110	-2.04	-1.12	-0.0383	1.0112	-0.0001	-0.0022	1.7961	1.504
	60.	0.80	171.1	7.49	58.92	81.26	0.3023	0.3122	-0.63	-0.34	-0.0119	1.0075	-0.0005	-0.0010	0.6822	0.551
	80.	0.00	187.3	-1.25	42.63	71.32	0.3502	0.3496	-16.90	-10.27	-0.2944	0.5433	0.0476	0.0563	34.5546	22.869
	80.	0.02	181.5	1.92	43.99	72.24	0.3414	0.3408	-15.54	-9.35	-0.2723	0.6296	0.0383	0.0276	28.9369	19.015
	80.	0.05	173.8	6.07	45.82	73.45	0.3315	0.3314	-13.71	-8.13	-0.2421	0.7310	0.0289	0.0182	22.4235	14.721
	80.	0.10	163.3	11.71	48.39	75.09	0.3207	0.3216	-11.14	-6.50	-0.1991	0.8364	0.0181	0.0085	14.9772	10.078
	80.	0.20	148.7	19.63	52.16	77.39	0.3097	0.3131	-7.30	-4.21	-0.1347	0.9398	0.0070	-0.0021	7.3187	5.517
	80.	0.50	149.1	19.39	57.34	80.39	0.3023	0.3107	-2.21	-1.32	-0.0417	1.0148	-0.0004	-0.0025	1.9466	1.715
	80.	0.80	171.2	7.47	58.86	81.23	0.3022	0.3121	-0.68	-0.33	-0.0129	1.0093	-0.0006	-0.0011	0.7389	0.691
	100.	0.00	185.3	-0.44	42.08	70.95	0.3493	0.3482	-17.45	-10.65	-0.3050	0.5439	0.0467	0.0350	33.9099	22.579
	100.	0.02	178.1	3.72	43.43	71.90	0.3405	0.3396	-16.05	-9.70	-0.2821	0.6353	0.0379	0.0264	28.4362	18.759
	100.	0.05	168.1	9.16	45.37	73.16	0.3307	0.3303	-14.17	-8.44	-0.2503	0.7372	0.0281	0.0171	21.9719	14.569
	100.	0.10	154.4	16.54	48.02	74.86	0.3200	0.3208	-11.52	-6.74	-0.2063	0.8426	0.0173	0.0076	14.6428	10.014
	100.	0.20	136.0	26.48	51.90	77.24	0.3092	0.3126	-7.64	-4.36	-0.1395	0.9453	0.0065	-0.0006	7.1550	5.563
	100.	0.50	149.2	19.33	57.25	80.34	0.3021	0.3103	-2.30	-1.27	-0.0431	1.0176	-0.0006	-0.0027	2.0185	1.775
	100.	0.80	171.2	7.46	58.83	81.22	0.3021	0.3121	-0.72	-0.39	-0.0133	1.0106	-0.0007	-0.0011	0.8205	0.627
	120.	0.00	190.2	2.59	41.81	70.77	0.3486	0.3476	-17.72	-10.84	-0.3093	0.5529	0.0459	0.0344	33.6047	22.356
	120.	0.02	170.8	7.63	43.23	71.73	0.3399	0.3391	-16.31	-9.87	-0.2865	0.6397	0.0372	0.0259	28.0795	18.627
	120.	0.05	158.4	14.36	45.14	73.01	0.3302	0.3298	-14.40	-8.59	-0.2543	0.7419	0.0274	0.0166	21.6616	14.445
	120.	0.10	141.7	23.40	47.83	74.74	0.3195	0.3204	-11.71	-6.86	-0.2095	0.8373	0.0168	0.0072	14.4052	9.953
	120.	0.20	136.4	26.29	51.77	77.16	0.3089	0.3123	-7.78	-4.44	-0.1417	0.9695	0.0061	-0.0009	7.0727	5.565
	120.	0.50	149.3	19.30	57.20	80.31	0.3020	0.3104	-2.34	-1.30	-0.0438	1.0197	-0.0008	-0.0023	2.0515	1.809
	120.	0.80	171.2	7.46	58.82	81.21	0.3020	0.3120	-0.73	-0.40	-0.0136	1.0116	-0.0003	-0.0012	0.8239	0.669
	140.	0.00	189.3	8.46	41.68	70.67	0.3482	0.3474	-17.86	-10.93	-0.3119	0.5561	0.0453	0.0342	33.3659	22.209
	140.	0.02	158.2	14.46	43.10	71.65	0.3395	0.3388	-16.43	-9.95	-0.2884	0.6432	0.0368	0.0256	27.8579	18.525
	140.	0.05	146.1	21.02	45.03	72.93	0.3298	0.3296	-14.51	-8.67	-0.2563	0.7456	0.0270	0.0164	21.4659	14.374
	140.	0.10	140.4	24.08	47.74	74.68	0.3192	0.3202	-11.81	-6.92	-0.2109	0.8412	0.0165	0.0070	14.2507	9.907
	140.	0.20	136.5	26.21	51.70	77.12	0.3087	0.3122	-7.84	-4.43	-0.1426	0.9728	0.0059	-0.0010	6.9913	5.534
	140.	0.50	149.3	19.28	57.18	80.30	0.3019	0.3104	-2.37	-1.31	-0.0441	1.0214	-0.0009	-0.0023	2.0659	1.810
	140.	0.80	171.2	7.45	58.81	81.20	0.3020	0.3120	-0.74	-0.41	-0.0136	1.0124	-0.0008	-0.0012	0.8370	0.666

Exhibit A-8 (continued)

Exhibit A-8 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 220.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
	20.	0.00	180.3	2.52	54.04	78.50	0.3325	0.3475	-9.86	-5.42	-0.1464	0.5900	0.0343	0.0367	29.4519	19.342
	20.	0.02	179.7	2.85	54.04	78.97	0.3271	0.3406	-9.04	-4.95	-0.1354	0.6622	0.0289	0.0299	25.0155	16.239
	20.	0.05	178.9	3.29	55.91	79.58	0.3208	0.3328	-7.95	-4.33	-0.1205	0.7581	0.0225	0.0220	19.6394	12.523
	20.	0.10	177.3	3.90	57.42	80.43	0.3133	0.3239	-6.42	-3.46	-0.0992	0.8471	0.0151	0.0132	13.2607	8.329
	20.	0.20	176.1	4.79	59.59	81.63	0.3052	0.3150	-4.20	-2.24	-0.0671	0.9372	0.0069	0.0044	6.2056	3.879
	20.	0.50	173.8	6.03	62.52	83.20	0.2988	0.3098	-1.22	-0.64	-0.0203	1.0036	0.0004	-0.0007	0.0000	0.043
	20.	0.80	173.2	6.40	63.36	83.64	0.2982	0.3100	-0.37	-0.19	-0.0054	1.0036	-0.0002	-0.0005	0.0647	0.092
	40.	0.00	183.2	1.00	45.69	75.23	0.3443	0.3527	-15.14	-8.61	-0.2343	0.5290	0.0460	0.0420	33.2103	23.011
	40.	0.02	181.0	2.16	49.91	76.04	0.3362	0.3437	-13.91	-7.83	-0.2172	0.6234	0.0379	0.0330	29.4583	19.763
	40.	0.05	178.1	3.71	51.56	77.04	0.3270	0.3337	-12.25	-6.84	-0.1932	0.7233	0.0283	0.0230	23.6554	15.452
	40.	0.10	174.2	5.83	53.87	78.40	0.3168	0.3231	-9.92	-5.47	-0.1590	0.8376	0.0183	0.0133	15.7663	10.423
	40.	0.20	168.6	8.87	57.23	80.33	0.3061	0.3132	-6.54	-3.53	-0.1076	0.9513	0.0073	0.0036	7.4072	5.004
	40.	0.50	161.0	12.95	61.60	82.83	0.2984	0.3068	-1.93	-1.02	-0.0333	1.0103	0.0001	-0.0017	1.5635	1.583
	40.	0.80	171.1	7.52	63.13	83.53	0.2980	0.3096	-0.59	-0.31	-0.0103	1.0071	-0.0004	-0.0003	0.5965	0.693
	60.	0.00	187.5	-1.35	46.02	73.58	0.3457	0.3497	-17.77	-10.29	-0.2329	0.5427	0.0474	0.0391	36.4922	23.924
	60.	0.02	183.4	0.87	47.44	74.59	0.3370	0.3406	-16.34	-9.37	-0.2503	0.6294	0.0336	0.0299	30.5610	19.697
	60.	0.05	178.0	3.81	49.37	75.70	0.3271	0.3306	-14.41	-8.16	-0.2329	0.7313	0.0233	0.0209	23.5695	15.335
	60.	0.10	170.6	7.81	52.07	77.34	0.3163	0.3203	-11.70	-6.52	-0.1903	0.8380	0.0139	0.0097	15.6574	10.279
	60.	0.20	160.1	13.45	56.01	79.64	0.3054	0.3111	-7.74	-4.21	-0.1291	0.9419	0.0070	0.0046	7.4368	5.037
	60.	0.50	149.0	19.46	61.42	82.62	0.2989	0.3081	-2.31	-1.22	-0.0399	1.0161	-0.0004	-0.0024	1.9032	1.602
	60.	0.80	171.2	7.48	63.01	83.46	0.2978	0.3094	-0.71	-0.37	-0.0124	1.0099	-0.0006	-0.0011	0.7507	0.592
	80.	0.00	190.2	-2.83	44.72	72.73	0.3447	0.3471	-19.04	-11.12	-0.3051	0.5506	0.0464	0.0365	35.7378	23.592
	80.	0.02	184.0	0.52	46.25	73.73	0.3359	0.3381	-17.51	-10.13	-0.2822	0.6333	0.0373	0.0275	29.8229	19.585
	80.	0.05	176.0	4.87	48.30	75.04	0.3260	0.3284	-15.45	-8.82	-0.2509	0.7415	0.0277	0.0170	22.9584	15.137
	80.	0.10	165.1	10.78	51.19	76.81	0.3153	0.3184	-12.56	-7.04	-0.2064	0.8531	0.0169	0.0079	15.2605	10.061
	80.	0.20	149.8	19.04	55.41	79.29	0.3045	0.3099	-8.33	-4.55	-0.1396	0.9509	0.0062	-0.0006	7.3608	5.719
	80.	0.50	149.3	19.32	61.22	82.52	0.2976	0.3077	-2.50	-1.32	-0.0432	1.0207	-0.0003	-0.0027	2.0845	1.625
	80.	0.80	171.2	7.46	62.94	83.43	0.2976	0.3093	-0.78	-0.41	-0.0134	1.0121	-0.0003	-0.0012	0.8256	0.663
	100.	0.00	189.6	-2.47	44.09	72.31	0.3436	0.3457	-19.66	-11.54	-0.3160	0.5572	0.0453	0.0351	35.0765	23.279
	100.	0.02	181.5	1.89	45.66	73.35	0.3348	0.3368	-18.09	-10.50	-0.2922	0.6456	0.0364	0.0262	29.2143	19.529
	100.	0.05	170.9	7.60	47.77	74.70	0.3250	0.3272	-15.97	-9.14	-0.2599	0.7494	0.0266	0.0167	22.4560	14.963
	100.	0.10	156.6	15.33	50.75	76.55	0.3144	0.3173	-12.99	-7.30	-0.2133	0.8561	0.0160	0.0079	14.8153	10.007
	100.	0.20	136.8	26.04	55.10	79.12	0.3039	0.3093	-8.63	-4.72	-0.1446	0.9579	0.0065	-0.0011	7.2171	5.773
	100.	0.50	149.4	19.26	61.12	82.46	0.2974	0.3076	-2.60	-1.38	-0.0447	1.0241	-0.0010	-0.0022	2.1702	1.693
	100.	0.80	171.2	7.46	62.91	83.41	0.2975	0.3092	-0.81	-0.43	-0.0133	1.0137	-0.0009	-0.0012	0.8602	0.677
	120.	0.00	184.8	0.10	43.77	72.10	0.3428	0.3450	-19.97	-11.75	-0.3209	0.5624	0.0444	0.0345	34.6263	23.481
	120.	0.02	174.9	5.46	45.36	73.15	0.3340	0.3361	-18.38	-10.69	-0.2963	0.6513	0.0356	0.0256	28.8083	19.466
	120.	0.05	161.9	12.46	47.51	74.53	0.3243	0.3266	-16.23	-9.31	-0.2639	0.7554	0.0259	0.0161	22.0913	14.964
	120.	0.10	144.4	21.93	50.53	76.41	0.3138	0.3171	-13.21	-7.43	-0.2171	0.8722	0.0154	0.0066	14.5496	10.226
	120.	0.20	127.2	25.86	54.95	79.03	0.3035	0.3091	-8.78	-4.81	-0.1463	0.9633	0.0051	-0.0014	7.0997	5.789
	120.	0.50	149.4	19.23	61.07	82.43	0.2972	0.3073	-2.65	-1.40	-0.0454	1.0268	-0.0011	-0.0030	2.2146	1.822
	120.	0.80	171.2	7.45	62.80	83.40	0.2975	0.3092	-0.83	-0.44	-0.0140	1.0150	-0.0009	-0.0012	0.9164	0.692
	140.	0.00	174.7	5.54	43.61	71.99	0.3422	0.3447	-20.12	-11.83	-0.3230	0.5663	0.0438	0.0342	34.3675	22.966
	140.	0.02	163.1	11.83	45.21	73.05	0.3335	0.3358	-18.52	-10.79	-0.2937	0.6556	0.0351	0.0254	28.5601	19.067
	140.	0.05	148.4	19.77	47.37	74.45	0.3238	0.3264	-16.36	-9.39	-0.2657	0.7600	0.0255	0.0159	21.9333	14.762

Exhibit A-8 (continued)

140.	0.10	141.9	23.29	50.41	76.34	0.3134	0.3168	-13.31	-7.50	-0.2183	0.8769	0.0151	0.0064	14.3791	10.123
140.	0.20	137.3	25.78	54.87	78.98	0.3033	0.3089	-8.86	-4.85	-0.1473	0.9373	0.0049	-0.0015	7.0154	5.771
140.	0.50	149.5	19.22	61.04	82.42	0.2972	0.3074	-2.68	-1.42	-0.0457	1.0238	-0.0012	-0.0030	2.2254	1.825
140.	0.80	171.2	7.45	62.88	83.39	0.2974	0.3092	-0.84	-0.44	-0.0141	1.0139	-0.0009	-0.0012	0.9821	0.780
160.	0.00	158.3	14.41	43.53	71.94	0.3419	0.3446	-20.20	-11.90	-0.3239	0.5693	0.0435	0.0341	34.2112	22.982
160.	0.02	153.6	16.99	45.14	73.01	0.3332	0.3357	-18.59	-10.83	-0.2993	0.6583	0.0343	0.0253	23.4143	19.011
160.	0.05	148.6	19.68	47.31	74.41	0.3236	0.3263	-16.42	-9.43	-0.2663	0.7635	0.0252	0.0155	21.7286	16.522
160.	0.10	142.0	23.23	50.36	76.31	0.3132	0.3168	-13.37	-7.53	-0.2190	0.8695	0.0148	0.0063	14.2758	10.187
160.	0.20	137.4	25.75	54.83	78.96	0.3031	0.3089	-8.89	-4.87	-0.1431	0.9304	0.0047	-0.0016	6.9593	5.759
160.	0.50	149.5	19.21	61.03	82.41	0.2971	0.3074	-2.69	-1.43	-0.0453	1.0193	-0.0013	-0.0030	2.2447	1.829
160.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.44	-0.0142	1.0167	-0.0010	-0.0013	0.9469	0.784
180.	0.00	158.4	14.37	43.49	71.91	0.3417	0.3443	-20.23	-11.93	-0.3241	0.5715	0.0433	0.0341	34.1242	22.893
180.	0.02	153.6	16.96	45.10	72.98	0.3330	0.3357	-18.62	-10.85	-0.2993	0.6613	0.0346	0.0252	23.3337	18.939
180.	0.05	148.7	19.65	47.27	74.39	0.3234	0.3262	-16.45	-9.45	-0.2666	0.7661	0.0250	0.0153	21.6601	16.466
180.	0.10	142.1	23.21	50.33	76.29	0.3131	0.3167	-13.39	-7.54	-0.2192	0.8731	0.0147	0.0063	14.2149	10.167
180.	0.20	137.4	25.74	54.81	78.93	0.3030	0.3088	-8.91	-4.89	-0.1432	0.9327	0.0046	-0.0016	6.9241	5.750
180.	0.50	149.5	19.21	61.02	82.40	0.2971	0.3074	-2.70	-1.43	-0.0453	1.0214	-0.0013	-0.0030	2.2424	1.828
180.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.45	-0.0142	1.0172	-0.0010	-0.0013	0.9455	0.783
200.	0.00	158.4	14.36	43.47	71.90	0.3416	0.3443	-20.25	-11.94	-0.3242	0.5731	0.0432	0.0341	34.0797	22.881
200.	0.02	153.6	16.95	45.09	72.97	0.3329	0.3357	-18.64	-10.86	-0.2993	0.6630	0.0345	0.0252	23.2907	18.926
200.	0.05	148.7	19.64	47.26	74.38	0.3233	0.3262	-16.46	-9.46	-0.2666	0.7680	0.0249	0.0153	21.6216	16.453
200.	0.10	142.1	23.21	50.32	76.28	0.3130	0.3167	-13.40	-7.55	-0.2192	0.8750	0.0146	0.0063	14.1826	10.153
200.	0.20	137.4	25.74	54.80	78.94	0.3030	0.3088	-8.92	-4.89	-0.1433	0.9344	0.0046	-0.0016	6.9043	5.743
200.	0.50	149.5	19.21	61.01	82.40	0.2970	0.3074	-2.70	-1.43	-0.0459	1.0322	-0.0013	-0.0030	2.2426	1.840
200.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.45	-0.0142	1.0176	-0.0010	-0.0013	0.9477	0.787
210.	0.00	158.4	14.36	43.47	71.90	0.3416	0.3443	-20.25	-11.94	-0.3242	0.5736	0.0432	0.0341	34.0703	22.875
210.	0.02	153.6	16.95	45.08	72.97	0.3329	0.3357	-18.64	-10.87	-0.2993	0.6636	0.0345	0.0252	23.2816	18.921
210.	0.05	148.7	19.64	47.25	74.38	0.3233	0.3262	-16.47	-9.46	-0.2666	0.7686	0.0249	0.0153	21.6133	16.449
210.	0.10	142.1	23.21	50.31	76.28	0.3130	0.3167	-13.41	-7.55	-0.2192	0.8756	0.0146	0.0063	14.1756	10.148
210.	0.20	137.4	25.74	54.80	78.94	0.3030	0.3088	-8.92	-4.89	-0.1433	0.9349	0.0046	-0.0016	6.8995	5.741
210.	0.50	149.5	19.21	61.01	82.40	0.2970	0.3074	-2.70	-1.43	-0.0459	1.0327	-0.0013	-0.0030	2.2406	1.839
210.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.45	-0.0142	1.0177	-0.0010	-0.0013	0.9468	0.787
215.	0.00	158.4	14.36	43.47	71.90	0.3416	0.3443	-20.25	-11.94	-0.3242	0.5738	0.0432	0.0341	34.0681	22.867
215.	0.02	153.6	16.95	45.08	72.97	0.3329	0.3357	-18.64	-10.87	-0.2993	0.6633	0.0345	0.0252	23.2797	18.916
215.	0.05	148.7	19.64	47.25	74.38	0.3233	0.3262	-16.47	-9.46	-0.2666	0.7683	0.0249	0.0153	21.6114	16.443
215.	0.10	142.1	23.21	50.31	76.28	0.3130	0.3167	-13.41	-7.55	-0.2192	0.8753	0.0146	0.0063	14.1738	10.142
215.	0.20	137.4	25.74	54.80	78.94	0.3030	0.3088	-8.92	-4.89	-0.1433	0.9351	0.0046	-0.0016	6.8986	5.741
215.	0.50	149.5	19.21	61.01	82.40	0.2970	0.3074	-2.70	-1.43	-0.0459	1.0326	-0.0013	-0.0030	2.2395	1.839
215.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.45	-0.0142	1.0177	-0.0010	-0.0013	0.9468	0.787
218.	0.00	158.4	14.36	43.47	71.90	0.3416	0.3443	-20.25	-11.94	-0.3242	0.5738	0.0432	0.0341	34.0670	22.867
218.	0.02	153.6	16.95	45.08	72.97	0.3329	0.3357	-18.64	-10.87	-0.2993	0.6639	0.0345	0.0252	23.2793	18.916
218.	0.05	148.7	19.64	47.25	74.38	0.3233	0.3262	-16.47	-9.46	-0.2666	0.7689	0.0249	0.0153	21.6110	16.443
218.	0.10	142.1	23.21	50.31	76.28	0.3130	0.3167	-13.41	-7.55	-0.2192	0.8759	0.0146	0.0063	14.1733	10.142
218.	0.20	137.4	25.74	54.80	78.94	0.3030	0.3088	-8.92	-4.89	-0.1433	0.9351	0.0046	-0.0016	6.8982	5.741
218.	0.50	149.5	19.21	61.01	82.40	0.2970	0.3074	-2.71	-1.43	-0.0458	1.0326	-0.0013	-0.0030	2.2395	1.839
218.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.45	-0.0142	1.0173	-0.0010	-0.0013	0.9463	0.787
219.	0.00	158.4	14.36	43.47	71.90	0.3416	0.3443	-20.25	-11.94	-0.3242	0.5739	0.0432	0.0341	34.0677	22.867
219.	0.02	153.6	16.95	45.08	72.97	0.3329	0.3357	-18.64	-10.87	-0.2993	0.6639	0.0345	0.0252	23.2792	18.916
219.	0.05	148.7	19.64	47.25	74.38	0.3233	0.3262	-16.47	-9.46	-0.2666	0.7689	0.0249	0.0153	21.6110	16.443
219.	0.10	142.1	23.21	50.31	76.28	0.3130	0.3167	-13.41	-7.55	-0.2192	0.8759	0.0146	0.0063	14.1733	10.142
219.	0.20	137.4	25.74	54.80	78.94	0.3030	0.3088	-8.92	-4.89	-0.1433	0.9352	0.0046	-0.0016	6.8979	5.741
219.	0.50	149.5	19.21	61.01	82.40	0.2970	0.3074	-2.71	-1.43	-0.0458	1.0326	-0.0013	-0.0030	2.2396	1.839
219.	0.80	171.2	7.45	62.87	83.39	0.2974	0.3092	-0.85	-0.45	-0.0142	1.0178	-0.0010	-0.0013	0.9463	0.787

Exhibit A-8 (continued)

CONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.
SIGMA Y (M) = 6411.
SIGMA Z (M) = 363.
SO2-SO4 CONVERSION RATE= 0.0215 PERCENT/HR
NOX-NO3 CONVERSION RATE= 0.1508 PERCENT/HR

ALTITUDE	NOX (PPM)	NO2 (PPM)	NO3- (PPM)	NO2/NTOT (MOLE %)	NO3-/NTOT (MOLE %)	SO2 (PPM)	SO4= (UG/M3)	SO4=/STOT (MOLE %)	O3 (PPM)	PRIMARY BSP (UG/M3)	TOTAL BSP (10-6 M-1)	DSPSN/BS (%)
H+2S												
INCREMENT!	0.014	0.010	0.000	68.133	3.021	0.003	0.073	0.663	-0.029	0.988	0.014	16.562
TOTAL AMB!	0.014	0.010	0.000	68.133	3.021	0.003	3.009	21.034	0.029	13.924	0.143	60.066
H+1S												
INCREMENT!	0.019	0.013	0.000	69.063	0.674	0.004	0.024	0.137	-0.010	1.356	0.018	8.957
TOTAL AMB!	0.019	0.013	0.000	69.063	0.674	0.004	2.960	15.095	0.023	14.292	0.146	57.776
H												
INCREMENT!	0.031	0.021	0.000	66.363	0.350	0.006	0.022	0.036	-0.013	2.208	0.023	3.217
TOTAL AMB!	0.031	0.021	0.000	66.363	0.350	0.006	2.953	10.457	0.025	15.144	0.155	53.843
H-1S												
INCREMENT!	0.031	0.021	0.000	65.154	0.460	0.006	0.029	0.116	-0.014	2.208	0.023	2.949
TOTAL AMB!	0.031	0.021	0.000	65.154	0.460	0.006	2.963	10.436	0.024	15.144	0.156	53.966
H-2S												
INCREMENT!	0.031	0.020	0.000	61.697	1.332	0.006	0.031	0.319	-0.017	2.208	0.030	7.741
TOTAL AMB!	0.031	0.020	0.000	61.697	1.332	0.006	3.017	10.666	0.021	15.144	0.153	56.336
G												
INCREMENT!	0.031	0.019	0.001	59.379	2.439	0.006	0.133	0.531	-0.019	2.208	0.031	13.247
TOTAL AMB!	0.031	0.019	0.001	59.379	2.439	0.006	3.071	10.536	0.019	15.144	0.159	54.772

CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INITIAL FLUX)

	SO2!	0.0000
	NOX!	0.0000
PRIMARY PARTICULATE!		0.0000
	SO4!	0.0000
	NO3!	0.0000

Exhibit A-8 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RVO	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	30.	0.02	180.9	2.20	94.79	97.95	0.3415	0.3523	-10.12	-3.92	-0.0944	0.7291	0.0226	0.0213	21.1581	13.735
	30.	0.05	179.6	2.94	93.48	97.42	0.3431	0.3526	-11.43	-4.44	-0.1069	0.7295	0.0242	0.0215	22.1869	14.336
	30.	0.10	177.6	4.02	93.39	97.39	0.3404	0.3483	-11.52	-4.43	-0.1110	0.7507	0.0216	0.0173	19.4896	12.425
	30.	0.20	174.3	5.53	96.21	98.52	0.3311	0.3384	-8.70	-3.35	-0.0867	0.8969	0.0122	0.0074	11.1019	6.981
	30.	0.50	171.7	7.17	102.50	100.96	0.3203	0.3305	-2.41	-0.91	-0.0360	0.9924	0.0014	-0.0003	1.5472	1.379
	30.	0.80	171.5	7.29	104.28	101.63	0.3191	0.3306	-0.62	-0.23	-0.0073	0.9953	0.0002	-0.0004	0.5448	0.621
	45.	0.02	182.2	1.51	96.42	98.60	0.3339	0.3509	-8.49	-3.27	-0.0739	0.7402	0.0200	0.0193	19.1865	12.499
	45.	0.05	181.0	2.14	94.94	98.01	0.3412	0.3521	-9.97	-3.85	-0.0929	0.7309	0.0224	0.0211	20.2437	13.507
	45.	0.10	179.5	2.95	95.14	98.09	0.3383	0.3478	-9.77	-3.73	-0.0929	0.7550	0.0194	0.0167	17.2060	11.454
	45.	0.20	177.9	3.86	98.41	99.38	0.3285	0.3373	-6.50	-2.48	-0.0640	0.9146	0.0096	0.0064	8.5536	5.869
	45.	0.50	175.7	5.03	103.11	101.19	0.3201	0.3303	-1.80	-0.68	-0.0192	0.9933	0.0012	-0.0002	1.4245	1.097
	45.	0.80	175.0	5.41	104.44	101.69	0.3191	0.3303	-0.46	-0.17	-0.0054	0.9969	0.0002	-0.0003	0.4048	0.393
	60.	0.02	182.7	1.23	97.29	98.94	0.3372	0.3496	-7.62	-2.92	-0.0696	0.7523	0.0183	0.0165	17.8127	11.611
	60.	0.05	181.7	1.76	96.11	98.48	0.3389	0.3504	-8.79	-3.39	-0.0814	0.7469	0.0201	0.0184	19.0604	12.373
	60.	0.10	180.3	2.42	96.54	98.65	0.3357	0.3460	-8.37	-3.22	-0.0791	0.8095	0.0163	0.0140	15.7603	10.079
	60.	0.20	179.2	3.13	99.47	99.80	0.3271	0.3368	-5.44	-2.07	-0.0532	0.9269	0.0082	0.0058	7.9660	5.205
	60.	0.50	177.4	4.12	103.41	101.30	0.3199	0.3309	-1.50	-0.56	-0.0160	0.9965	0.0010	-0.0001	1.2367	0.969
	60.	0.80	176.8	4.41	104.52	101.72	0.3191	0.3303	-0.39	-0.15	-0.0045	0.9974	0.0002	-0.0002	0.3453	0.357
	90.	0.02	183.0	1.07	97.69	99.18	0.3359	0.3486	-7.02	-2.69	-0.0638	0.7633	0.0171	0.0175	16.7090	10.990
	90.	0.05	182.1	1.54	96.86	98.77	0.3374	0.3492	-8.05	-3.09	-0.0742	0.7622	0.0163	0.0162	17.7693	11.589
	90.	0.10	181.1	2.09	97.55	99.04	0.3338	0.3443	-7.36	-2.82	-0.0693	0.8276	0.0149	0.0136	14.0912	8.993
	90.	0.20	180.0	2.70	100.13	100.05	0.3262	0.3363	-4.78	-1.82	-0.0466	0.9320	0.0073	0.0053	6.8509	4.524
	90.	0.50	178.4	3.56	103.59	101.37	0.3198	0.3309	-1.32	-0.49	-0.0140	0.9951	0.0009	-0.0001	1.0692	0.787
	90.	0.80	177.9	3.82	104.57	101.74	0.3190	0.3309	-0.34	-0.13	-0.0039	0.9973	0.0002	-0.0002	0.2966	0.325
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.26	179.3	2.96	101.18	100.46	0.3238	0.3340	-3.72	-1.41	-0.0370	0.9604	0.0049	0.0029	4.5828	2.971
90.																
	30.	0.02	181.2	2.04	53.29	78.06	0.3239	0.3360	-6.20	-3.51	-0.1001	0.7321	0.0222	0.0223	18.7266	12.131
	30.	0.05	179.9	2.75	52.49	77.59	0.3254	0.3362	-7.00	-3.93	-0.1146	0.7335	0.0236	0.0230	19.5483	12.608
	30.	0.10	177.9	3.82	52.43	77.55	0.3226	0.3316	-7.06	-4.02	-0.1179	0.7364	0.0203	0.0183	16.0923	10.535
	30.	0.20	175.1	5.36	54.13	78.56	0.3132	0.3208	-5.35	-3.02	-0.0925	0.9042	0.0114	0.0076	9.4275	5.974
	30.	0.50	171.9	7.09	57.94	80.72	0.3029	0.3124	-1.55	-0.85	-0.0239	0.9976	0.0011	-0.0003	1.5131	1.210
	30.	0.80	171.6	7.25	59.01	81.32	0.3018	0.3126	-0.47	-0.26	-0.0093	0.9993	0.0001	-0.0006	0.4941	0.623
	45.	0.02	182.4	1.38	54.29	78.65	0.3214	0.3343	-5.20	-2.93	-0.0827	0.7422	0.0197	0.0213	17.0545	11.034
	45.	0.05	181.3	1.99	53.38	78.12	0.3237	0.3358	-6.10	-3.45	-0.0985	0.7338	0.0219	0.0226	18.5422	12.012
	45.	0.10	179.8	2.79	53.50	78.19	0.3206	0.3310	-5.99	-3.39	-0.0936	0.7923	0.0183	0.0178	15.7069	10.041
	45.	0.20	178.1	3.74	55.49	79.34	0.3108	0.3199	-4.00	-2.33	-0.0633	0.9198	0.0091	0.0067	7.5789	4.772
	45.	0.50	175.8	4.99	58.33	80.94	0.3027	0.3128	-1.15	-0.63	-0.0213	0.9975	0.0009	-0.0004	1.1503	0.895
	45.	0.80	175.1	5.37	59.14	81.38	0.3018	0.3128	-0.35	-0.19	-0.0063	0.9995	0.0001	-0.0004	0.3628	0.508
	60.	0.02	182.9	1.12	54.02	78.96	0.3198	0.3332	-4.67	-2.62	-0.0737	0.7340	0.0180	0.0199	15.8585	10.215
	60.	0.05	182.0	1.63	54.10	78.54	0.3214	0.3340	-5.38	-3.03	-0.0863	0.7514	0.0197	0.0203	16.9030	10.869

Exhibit A-8 (continued)

60.	0.10	180.3	2.29	54.36	78.69	0.3181	0.3291	-5.13	-2.89	-0.0339	0.8131	0.0163	0.0153	13.8593	8.852
60.	0.20	179.4	3.03	56.14	79.71	0.3096	0.3192	-3.35	-1.85	-0.0563	0.9292	0.0073	0.0060	6.5633	4.124
60.	0.50	177.5	4.07	58.52	81.05	0.3026	0.3129	-0.96	-0.53	-0.0173	0.9976	0.0003	-0.0003	0.9787	0.747
60.	0.80	176.9	4.38	59.19	81.42	0.3018	0.3129	-0.29	-0.16	-0.0057	0.9995	0.0001	-0.0003	0.3009	0.255
90.	0.02	183.2	0.97	55.19	79.17	0.3185	0.3320	-4.29	-2.40	-0.0673	0.7653	0.0163	0.0183	14.8339	9.633
90.	0.05	182.4	1.42	54.56	78.81	0.3199	0.3327	-4.93	-2.77	-0.0735	0.7644	0.0181	0.0194	15.7730	10.214
90.	0.10	181.4	1.97	54.97	79.04	0.3162	0.3275	-4.51	-2.53	-0.0735	0.8303	0.0144	0.0142	12.3974	7.911
90.	0.20	189.2	2.62	56.54	79.94	0.3087	0.3187	-2.94	-1.63	-0.0493	0.9357	0.0069	0.0055	5.8909	3.697
90.	0.50	178.5	3.52	58.64	81.11	0.3025	0.3130	-0.84	-0.46	-0.0156	0.9978	0.0003	-0.0002	0.8626	0.656
90.	0.80	178.0	3.79	59.23	81.43	0.3018	0.3129	-0.26	-0.14	-0.0050	0.9996	0.0001	-0.0003	0.2631	0.223

OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE

90.	0.26	179.7	2.88	57.18	80.30	0.3063	0.3162	-2.39	-1.27	-0.0397	0.9640	0.0046	0.0030	3.8785	2.452

Exhibit A-8 (continued)

VISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.
SIGHT PATH IS THROUGH PLUME CENTER

THETA	ALPHA	RP/RV0	RV	SREDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
	30.	0.02	181.4	1.94	57.01	80.20	0.3200	0.3340	-6.99	-3.73	-0.1083	0.7333	0.0219	0.0230	19.5694	12.587
	30.	0.05	180.1	2.63	56.10	79.69	0.3214	0.3342	-7.90	-4.29	-0.1183	0.7353	0.0233	0.0232	20.3009	13.063
	30.	0.10	178.2	3.69	56.01	79.64	0.3135	0.3293	-7.98	-4.34	-0.1223	0.7394	0.0205	0.0183	17.6587	11.204
	30.	0.20	175.3	5.25	57.92	80.71	0.3091	0.3183	-6.08	-3.27	-0.0964	0.9035	0.0111	0.0074	9.6260	6.156
	30.	0.50	172.0	7.04	62.18	83.02	0.2969	0.3100	-1.82	-0.96	-0.0319	1.0910	0.0009	-0.0010	1.5979	1.284
	30.	0.80	171.7	7.21	63.39	83.66	0.2980	0.3102	-0.61	-0.32	-0.0103	1.0947	-0.0001	-0.0007	0.5721	0.492
	45.	0.02	182.6	1.30	58.14	80.83	0.3175	0.3325	-5.86	-3.14	-0.0857	0.7427	0.0195	0.0215	17.8468	11.512
	45.	0.05	181.5	1.88	57.11	80.26	0.3197	0.3338	-6.88	-3.72	-0.1021	0.7349	0.0217	0.0229	19.3783	12.463
	45.	0.10	180.0	2.68	57.23	80.33	0.3166	0.3288	-6.76	-3.65	-0.1023	0.7944	0.0133	0.0179	16.3673	10.295
	45.	0.20	178.2	3.66	59.46	81.56	0.3063	0.3175	-4.54	-2.42	-0.0712	0.9229	0.0033	0.0056	7.8139	4.917
	45.	0.50	175.8	4.93	62.64	83.27	0.2938	0.3104	-1.35	-0.71	-0.0229	0.9299	0.0003	-0.0006	1.4849	0.956
	45.	0.80	175.1	5.34	63.54	83.74	0.2980	0.3104	-0.45	-0.24	-0.0083	1.0011	-0.0000	-0.0003	0.4161	0.359
	60.	0.02	183.1	1.05	58.74	81.16	0.3159	0.3311	-5.26	-2.81	-0.0764	0.7543	0.0179	0.0202	16.6032	10.747
	60.	0.05	182.2	1.54	57.93	80.71	0.3175	0.3319	-6.07	-3.26	-0.0894	0.7522	0.0194	0.0210	17.6733	11.565
	60.	0.10	180.9	2.20	58.20	80.87	0.3141	0.3269	-5.79	-3.11	-0.0871	0.8149	0.0161	0.0169	14.4418	9.163
	60.	0.20	179.3	2.97	60.20	81.96	0.3056	0.3168	-3.80	-2.02	-0.0592	0.9317	0.0076	0.0090	6.7747	4.252
	60.	0.50	177.5	4.04	62.87	83.39	0.2988	0.3105	-1.13	-0.59	-0.0190	0.9996	0.0007	-0.0003	1.0005	0.706
	60.	0.80	176.9	4.36	63.62	83.78	0.2981	0.3103	-0.38	-0.20	-0.0066	1.0009	0.0000	-0.0004	0.3441	0.297
	90.	0.02	183.3	0.91	59.16	81.40	0.3147	0.3299	-4.84	-2.53	-0.0700	0.7655	0.0166	0.0190	15.5209	10.092
	90.	0.05	182.5	1.34	58.44	81.00	0.3160	0.3306	-5.55	-2.93	-0.0815	0.7651	0.0139	0.0197	16.4966	10.604
	90.	0.10	181.3	1.89	58.90	81.25	0.3123	0.3253	-5.10	-2.72	-0.0763	0.8323	0.0142	0.0143	12.9220	8.196
	90.	0.20	180.3	2.56	60.66	82.21	0.3048	0.3163	-3.34	-1.77	-0.0519	0.9379	0.0067	0.0056	6.8248	4.813
	90.	0.50	178.5	3.49	63.00	83.46	0.2987	0.3106	-0.99	-0.52	-0.0167	0.9995	0.0007	-0.0003	0.8758	0.693
	90.	0.80	178.0	3.77	63.66	83.81	0.2981	0.3106	-0.33	-0.17	-0.0053	1.0008	0.0000	-0.0004	0.3008	0.260
OBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND DIRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FROM THE SOURCE																
	90.	0.26	179.8	2.84	61.37	82.59	0.3024	0.3138	-2.62	-1.33	-0.0415	0.9662	0.0044	0.0029	3.9823	2.537

Exhibit A-8 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	ERATIO	DELX	DELY	E(LUV)	E(LAB)
45.															
	30.	15.	2.95	38.66	68.53	0.3155	0.3375	-2.94	-2.09	-0.0594	0.3405	0.0547	0.0663	45.9437	29.3256
	30.	30.	1.41	25.54	57.63	0.3157	0.3358	1.33	1.30	0.0793	0.2607	0.0630	0.0769	43.6010	28.5202
	30.	45.	0.88	20.73	52.68	0.3187	0.3375	2.93	3.42	0.1918	0.2330	0.0665	0.0823	40.6927	27.0953
	30.	60.	0.60	18.46	50.09	0.3214	0.3395	3.70	4.74	0.2774	0.2129	0.0726	0.0867	39.6141	27.0329
	30.	75.	0.44	17.38	48.73	0.3233	0.3411	4.04	5.47	0.3305	0.2001	0.0750	0.0892	39.0915	27.0752
	30.	90.	0.39	17.06	48.37	0.3240	0.3417	4.14	5.70	0.3484	0.1961	0.0759	0.0901	38.9597	27.0163
	45.	15.	2.10	39.02	68.79	0.3028	0.3246	-2.58	-1.83	-0.0433	0.4261	0.0421	0.0536	37.4196	23.7699
	45.	30.	1.04	24.98	57.09	0.3005	0.3198	0.78	0.76	0.0537	0.3502	0.0478	0.0609	34.3555	22.6650
	45.	45.	0.63	19.82	51.67	0.3020	0.3220	2.03	2.42	0.1381	0.3222	0.0519	0.0653	32.2379	21.9002
	45.	60.	0.51	17.41	48.81	0.3037	0.3210	2.63	3.47	0.2028	0.2993	0.0548	0.0682	31.0387	21.6251
	45.	75.	0.42	16.27	47.37	0.3048	0.3218	2.93	4.06	0.2434	0.2876	0.0565	0.0699	30.4163	21.5607
	45.	90.	0.39	15.93	46.92	0.3052	0.3221	3.01	4.23	0.2572	0.2836	0.0571	0.0704	30.2254	21.5408
	60.	15.	1.73	39.39	63.99	0.2962	0.3171	-2.31	-1.63	-0.0383	0.4327	0.0354	0.0461	32.4034	20.5321
	60.	30.	0.88	24.77	55.88	0.2927	0.3109	0.57	0.56	0.0430	0.4192	0.0400	0.0521	29.5065	19.4671
	60.	45.	0.60	19.43	51.23	0.2935	0.3104	1.66	1.97	0.1138	0.3313	0.0435	0.0553	27.6437	18.8056
	60.	60.	0.47	16.94	48.22	0.2948	0.3110	2.18	2.87	0.1662	0.3037	0.0459	0.0582	26.5035	18.4250
	60.	75.	0.41	15.76	46.70	0.2957	0.3115	2.42	3.33	0.2024	0.3469	0.0474	0.0596	25.9143	18.3457
	60.	90.	0.39	15.41	46.23	0.2960	0.3117	2.49	3.55	0.2141	0.3629	0.0478	0.0601	25.7299	18.3078
	90.	15.	1.51	39.50	69.14	0.2919	0.3121	-2.11	-1.49	-0.0347	0.5299	0.0312	0.0411	29.1667	18.4662
	90.	30.	0.78	24.66	56.77	0.2878	0.3051	0.45	0.45	0.0363	0.4619	0.0351	0.0463	26.4339	17.3676
	90.	45.	0.55	19.20	50.96	0.2882	0.3042	1.43	1.70	0.0991	0.4258	0.0382	0.0495	24.6336	16.7870
	90.	60.	0.45	16.65	47.86	0.2892	0.3044	1.89	2.51	0.1471	0.4024	0.0403	0.0517	23.5763	16.4249
	90.	75.	0.41	15.45	46.28	0.2899	0.3048	2.11	2.97	0.1773	0.3895	0.0416	0.0529	23.0102	16.2643
	90.	90.	0.39	15.09	45.80	0.2902	0.3050	2.17	3.12	0.1876	0.3853	0.0420	0.0533	22.8469	16.2450
90.															
	30.	15.	2.95	23.19	55.31	0.3010	0.3236	-3.14	-3.08	-0.0954	0.3591	0.0512	0.0669	39.7693	26.0318
	30.	30.	1.41	15.00	45.67	0.3000	0.3206	-0.39	-0.53	0.0021	0.2917	0.0578	0.0761	36.0451	24.8433
	30.	45.	0.88	11.98	41.22	0.3022	0.3217	0.66	1.07	0.0369	0.2571	0.0625	0.0813	33.6206	23.9606
	30.	60.	0.60	10.55	38.86	0.3045	0.3235	1.15	2.06	0.1513	0.2359	0.0659	0.0849	31.9561	23.5646
	30.	75.	0.44	9.87	37.66	0.3062	0.3249	1.37	2.61	0.1911	0.2236	0.0681	0.0873	31.2783	23.4285
	30.	90.	0.39	9.67	37.28	0.3068	0.3253	1.44	2.78	0.2044	0.2194	0.0689	0.0881	31.0200	23.4087
	45.	15.	2.10	23.76	55.83	0.2838	0.3102	-2.58	-2.51	-0.0761	0.4445	0.0299	0.0535	32.3020	21.2044
	45.	30.	1.04	14.97	45.63	0.2855	0.3042	-0.42	-0.57	-0.0029	0.3349	0.0433	0.0596	28.8027	19.6125
	45.	45.	0.63	11.72	40.81	0.2862	0.3036	0.41	0.66	0.0609	0.3509	0.0465	0.0632	26.4013	18.8912
	45.	60.	0.51	10.20	38.24	0.2874	0.3042	0.80	1.45	0.1093	0.3297	0.0493	0.0667	24.9004	18.3937
	45.	75.	0.42	9.48	36.93	0.2883	0.3048	0.93	1.89	0.1405	0.3179	0.0503	0.0672	24.2547	18.1671
	45.	90.	0.39	9.26	36.53	0.2887	0.3050	1.03	2.03	0.1509	0.3140	0.0503	0.0676	24.0271	18.1004
	60.	15.	1.73	24.09	56.21	0.2825	0.3026	-2.24	-2.17	-0.0655	0.5007	0.0327	0.0459	23.1093	18.3763
	60.	30.	0.88	14.99	45.66	0.2782	0.2952	-0.40	-0.54	-0.0041	0.4455	0.0360	0.0506	24.7093	17.0837
	60.	45.	0.60	11.62	40.65	0.2783	0.2940	0.31	0.51	0.0406	0.4123	0.0386	0.0536	22.6083	16.1730
	60.	60.	0.47	10.05	37.97	0.2791	0.2941	0.64	1.18	0.0903	0.3912	0.0405	0.0556	21.3112	15.6037
	60.	75.	0.41	9.30	36.60	0.2797	0.2944	0.80	1.56	0.1163	0.3794	0.0417	0.0567	20.6212	15.4556
	60.	90.	0.39	9.08	36.18	0.2800	0.2945	0.85	1.68	0.1256	0.3756	0.0421	0.0571	20.4044	15.3837
	90.	15.	1.51	24.31	56.43	0.2785	0.2975	-2.02	-1.93	-0.0585	0.5414	0.0287	0.0408	25.2270	16.4776
	90.	30.	0.78	15.01	45.69	0.2737	0.2894	-0.37	-0.51	-0.0044	0.4365	0.0315	0.0448	22.1378	15.2114
	90.	45.	0.55	11.57	40.57	0.2734	0.2878	0.23	0.42	0.0429	0.4570	0.0337	0.0474	20.1310	14.4022
	90.	60.	0.45	9.96	37.81	0.2740	0.2876	0.55	1.02	0.0793	0.4361	0.0354	0.0491	18.9313	13.9485
	90.	75.	0.41	9.20	36.40	0.2744	0.2877	0.70	1.35	0.1022	0.4244	0.0364	0.0501	18.2693	13.7195
	90.	90.	0.39	8.97	35.97	0.2746	0.2878	0.74	1.46	0.1100	0.4205	0.0367	0.0504	18.0357	13.6496

Exhibit A-8 (continued)

VISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS THROUGH PLUME CENTER
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
PLUME ALTITUDE (M) = 392.

THETA	ALPHA	BETA	RP	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.															
	30.	15.	2.95	25.93	58.01	0.2989	0.3228	-4.56	-4.10	-0.1211	0.3623	0.0502	0.0676	42.8259	27.8196
	30.	30.	1.41	16.50	47.67	0.2961	0.3191	-1.36	-1.70	-0.0416	0.2991	0.0359	0.0761	33.7595	26.5359
	30.	45.	0.88	13.01	42.83	0.2973	0.3198	-0.13	-0.20	0.0277	0.2657	0.0301	0.0311	35.0980	25.2686
	30.	60.	0.60	11.37	40.24	0.2998	0.3215	0.44	0.74	0.0602	0.2468	0.0283	0.0346	34.3095	24.7497
	30.	75.	0.44	10.58	38.91	0.3014	0.3229	0.70	1.24	0.1126	0.2325	0.0253	0.0370	33.5289	24.5784
	30.	90.	0.39	10.35	38.50	0.3020	0.3235	0.78	1.41	0.1234	0.2273	0.0261	0.0378	33.3194	24.5454
	45.	15.	2.10	26.83	58.85	0.2853	0.3089	-3.66	-3.25	-0.0948	0.4406	0.0331	0.0537	34.7077	22.5471
	45.	30.	1.04	16.71	47.93	0.2817	0.3021	-1.15	-1.44	-0.0350	0.3943	0.0415	0.0592	30.9146	20.9521
	45.	45.	0.63	12.96	42.74	0.2820	0.3012	-0.19	-0.29	0.0173	0.3629	0.0343	0.0625	28.3150	19.8243
	45.	60.	0.51	11.19	39.94	0.2829	0.3016	0.26	0.44	0.0374	0.3427	0.0364	0.0648	26.7016	19.2304
	45.	75.	0.42	10.36	38.52	0.2837	0.3021	0.48	0.85	0.0826	0.3312	0.0376	0.0662	25.9780	19.0007
	45.	90.	0.39	10.11	38.03	0.2840	0.3023	0.54	0.93	0.0911	0.3275	0.0381	0.0666	25.7300	18.9158
	60.	15.	1.73	27.33	59.31	0.2796	0.3010	-3.16	-2.79	-0.0310	0.5065	0.0348	0.0658	30.1466	19.5110
	60.	30.	0.88	16.84	48.10	0.2746	0.2930	-1.02	-1.25	-0.0306	0.4564	0.0344	0.0601	26.5787	18.6065
	60.	45.	0.60	12.95	42.73	0.2743	0.2915	-0.19	-0.29	0.0134	0.4253	0.0366	0.0527	24.3274	17.9062
	60.	60.	0.47	11.13	39.83	0.2748	0.2913	0.29	0.33	0.0473	0.4050	0.0383	0.0545	23.0231	16.4367
	60.	75.	0.41	10.26	38.35	0.2753	0.2913	0.53	0.68	0.0686	0.3943	0.0393	0.0556	22.0737	16.1462
	60.	90.	0.39	10.00	37.89	0.2755	0.2916	0.44	0.80	0.0758	0.3911	0.0396	0.0559	21.8377	16.0573
	90.	15.	1.51	27.66	59.61	0.2756	0.2959	-2.83	-2.49	-0.0720	0.5474	0.0279	0.0507	27.0315	17.4795
	90.	30.	0.73	16.94	48.22	0.2702	0.2872	-0.92	-1.14	-0.0276	0.5007	0.0300	0.0462	23.7197	16.0623
	90.	45.	0.55	12.96	42.74	0.2696	0.2852	-0.19	-0.28	0.0112	0.4711	0.0319	0.0465	21.5603	15.1340
	90.	60.	0.45	11.09	39.77	0.2699	0.2848	0.16	0.27	0.0412	0.4513	0.0333	0.0480	20.2649	14.5906
	90.	75.	0.41	10.21	38.25	0.2702	0.2848	0.33	0.53	0.0600	0.4407	0.0341	0.0489	19.5693	14.3215
	90.	90.	0.39	9.94	37.73	0.2703	0.2849	0.33	0.69	0.0664	0.4372	0.0344	0.0492	19.3495	14.2359

Exhibit A-8 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
THETA = 45.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	95.89	98.39	0.3378	0.3484	-2.13	-0.84	-0.0286	0.9041	0.0069	0.0062	5.6133	3.7499
1.0	0.02	0.05	94.15	97.70	0.3423	0.3523	-4.77	-1.89	-0.0463	0.8171	0.0128	0.0123	11.6026	7.8651
1.0	0.02	0.10	93.72	97.52	0.3434	0.3523	-6.48	-2.56	-0.0625	0.7739	0.0167	0.0165	15.4584	10.2393
1.0	0.02	0.20	95.34	98.17	0.3405	0.3503	-6.72	-2.62	-0.0632	0.7643	0.0171	0.0173	16.2384	10.7091
1.0	0.02	0.50	97.59	99.06	0.3382	0.3439	-7.04	-2.70	-0.0642	0.7591	0.0174	0.0173	16.9455	11.0345
1.0	0.02	0.80	98.27	99.33	0.3381	0.3491	-7.12	-2.72	-0.0645	0.7569	0.0174	0.0179	17.0066	11.1225
1.0	0.05	0.05	95.16	98.10	0.3394	0.3494	-3.76	-1.48	-0.0365	0.8582	0.0099	0.0099	9.1054	6.0053
1.0	0.05	0.10	93.49	97.43	0.3431	0.3519	-6.71	-2.65	-0.0653	0.7925	0.0164	0.0156	14.9551	9.8483
1.0	0.05	0.20	94.49	97.83	0.3413	0.3501	-7.57	-2.96	-0.0723	0.7724	0.0179	0.0172	16.7115	10.9102
1.0	0.05	0.50	96.66	98.70	0.3393	0.3491	-7.97	-3.06	-0.0753	0.7646	0.0184	0.0180	17.5935	11.4686
1.0	0.05	0.80	97.32	98.95	0.3392	0.3493	-8.07	-3.09	-0.0742	0.7642	0.0185	0.0180	17.6825	11.5002
1.0	0.10	0.10	96.27	98.54	0.3356	0.3446	-3.93	-1.54	-0.0384	0.8397	0.0089	0.0083	8.2792	5.4722
1.0	0.10	0.20	95.22	98.12	0.3373	0.3451	-6.84	-2.67	-0.0663	0.8442	0.0140	0.0131	12.8114	8.2250
1.0	0.10	0.50	97.36	98.97	0.3355	0.3443	-7.27	-2.79	-0.0687	0.8307	0.0147	0.0132	13.6697	8.6310
1.0	0.10	0.80	98.00	99.22	0.3355	0.3446	-7.39	-2.82	-0.0693	0.8300	0.0148	0.0133	13.9685	8.9560
1.0	0.20	0.20	99.50	99.81	0.3276	0.3362	-2.56	-0.98	-0.0255	0.9606	0.0042	0.0032	3.9193	2.4676
1.0	0.20	0.50	99.94	99.98	0.3279	0.3361	-4.69	-1.73	-0.0459	0.9359	0.0071	0.0051	6.5833	4.1860
1.0	0.20	0.80	100.53	100.22	0.3279	0.3365	-4.81	-1.82	-0.0467	0.9348	0.0072	0.0052	6.7332	4.2278
1.0	0.50	0.50	103.99	101.49	0.3213	0.3310	-0.73	-0.28	-0.0077	0.9933	0.0005	-0.0000	0.5406	0.3923
1.0	0.50	0.80	104.04	101.54	0.3215	0.3311	-1.35	-0.50	-0.0141	0.9933	0.0003	-0.0002	0.9555	0.7104
1.0	0.80	0.80	105.17	101.96	0.3207	0.3311	-0.22	-0.08	-0.0024	1.0005	0.0000	-0.0001	0.1446	0.1217
0.3	0.02	0.02	34.84	65.65	0.3248	0.3352	-0.12	-0.10	-0.0023	0.9153	0.0054	0.0057	3.5310	2.3983
0.3	0.02	0.05	42.20	71.04	0.3197	0.3305	-0.58	-0.40	-0.0112	0.8331	0.0110	0.0117	8.0574	5.2743
0.3	0.02	0.10	52.15	77.39	0.3170	0.3291	-1.74	-1.03	-0.0285	0.7897	0.0151	0.0165	12.5639	8.0582
0.3	0.02	0.20	66.87	85.45	0.3172	0.3315	-3.59	-1.78	-0.0460	0.7567	0.0167	0.0187	15.6902	9.9827
0.3	0.02	0.50	83.24	95.27	0.3270	0.3421	-6.10	-2.50	-0.0604	0.7533	0.0174	0.0183	17.2922	11.1167
0.3	0.02	0.80	95.10	98.08	0.3333	0.3470	-6.83	-2.67	-0.0634	0.7562	0.0174	0.0182	17.1917	11.1629
0.3	0.05	0.05	42.40	71.17	0.3169	0.3273	-0.38	-0.26	-0.0072	0.8304	0.0031	0.0036	5.9540	3.8712
0.3	0.05	0.10	52.47	77.58	0.3155	0.3268	-1.42	-0.84	-0.0235	0.8094	0.0136	0.0142	11.1275	7.0434
0.3	0.05	0.20	66.81	85.42	0.3174	0.3308	-3.64	-1.81	-0.0476	0.7677	0.0169	0.0180	15.5111	9.7791
0.3	0.05	0.50	87.55	94.98	0.3230	0.3423	-6.78	-2.79	-0.0682	0.7574	0.0184	0.0190	17.9302	11.4565
0.3	0.05	0.80	94.23	97.73	0.3344	0.3472	-7.70	-3.01	-0.0726	0.7607	0.0185	0.0185	17.8393	11.5439
0.3	0.10	0.10	53.39	78.13	0.3084	0.3191	-0.50	-0.29	-0.0082	0.9096	0.0064	0.0065	5.2361	3.2492
0.3	0.10	0.20	67.96	86.00	0.3125	0.3246	-2.49	-1.23	-0.0336	0.8424	0.0120	0.0118	10.7056	6.6333
0.3	0.10	0.50	83.37	95.32	0.3243	0.3374	-5.97	-2.45	-0.0613	0.8221	0.0147	0.0140	14.0941	8.8556
0.3	0.10	0.80	94.95	98.01	0.3308	0.3424	-6.98	-2.73	-0.0672	0.8253	0.0149	0.0137	14.1797	9.0076
0.3	0.20	0.20	70.17	87.09	0.3033	0.3151	-0.29	-0.14	-0.0042	0.9638	0.0028	0.0024	2.3725	1.3951
0.3	0.20	0.50	90.95	96.39	0.3167	0.3290	-3.38	-1.38	-0.0362	0.9261	0.0071	0.0056	6.6269	4.0407
0.3	0.20	0.80	97.53	99.04	0.3232	0.3342	-4.40	-1.70	-0.0439	0.9209	0.0073	0.0055	6.8793	4.2675
0.3	0.50	0.50	94.28	97.75	0.3101	0.3236	-0.05	-0.02	-0.0010	0.9934	0.0005	0.0002	0.4052	0.2301
0.3	0.50	0.80	100.99	100.38	0.3168	0.3288	-0.94	-0.36	-0.0104	0.9927	0.0010	0.0001	0.9764	0.6396
0.3	0.80	0.80	101.92	100.74	0.3160	0.3287	-0.01	-0.00	-0.0003	0.9976	0.0001	0.0000	0.1101	0.0654
0.0	0.02	0.02	8.68	35.41	0.2747	0.2343	0.74	1.50	0.0933	0.8303	0.0080	0.0089	2.8378	2.4340

Exhibit A-8 (continued)

0.0	0.02	0.05	19.94	51.89	0.2816	0.2936	1.21	1.40	0.0689	0.7209	0.0116	0.0136	6.5905	4.5668
0.0	0.02	0.10	34.33	65.26	0.2904	0.3050	0.29	0.23	0.0139	0.7471	0.0150	0.0139	11.6659	7.6143
0.0	0.02	0.20	54.67	78.87	0.3014	0.3167	-2.24	-1.28	-0.0639	0.7421	0.0166	0.0193	15.6471	9.8112
0.0	0.02	0.50	84.23	93.56	0.3216	0.3389	-5.69	-2.41	-0.0585	0.7497	0.0174	0.0192	17.6669	11.1421
0.0	0.02	0.80	93.74	97.53	0.3312	0.3460	-6.70	-2.64	-0.0639	0.7543	0.0174	0.0184	17.2787	11.1799
0.0	0.05	0.05	19.79	51.64	0.2784	0.2896	1.07	1.24	0.0563	0.8344	0.0033	0.0096	4.6161	3.2456
0.0	0.05	0.10	34.89	65.70	0.2834	0.3021	0.84	0.66	0.0263	0.7756	0.0131	0.0151	9.7763	6.1965
0.0	0.05	0.20	54.95	79.03	0.3014	0.3178	-1.96	-1.12	-0.0339	0.7510	0.0166	0.0190	15.2465	9.4616
0.0	0.05	0.50	83.64	93.30	0.3227	0.3391	-6.28	-2.67	-0.0655	0.7529	0.0185	0.0194	18.1062	11.4778
0.0	0.05	0.80	92.90	97.19	0.3323	0.3462	-7.54	-2.98	-0.0719	0.7599	0.0186	0.0186	17.9815	11.5709
0.0	0.10	0.10	35.02	65.79	0.2811	0.2934	0.97	0.76	0.0295	0.8336	0.0053	0.0064	4.0703	2.6231
0.0	0.10	0.20	56.28	79.79	0.2963	0.3112	-0.63	-0.36	-0.0093	0.8241	0.0115	0.0123	10.2035	6.1904
0.0	0.10	0.50	84.52	93.68	0.3139	0.3341	-5.41	-2.29	-0.0576	0.8167	0.0147	0.0144	14.2291	8.8556
0.0	0.10	0.80	93.64	97.49	0.3236	0.3414	-6.81	-2.68	-0.0662	0.8236	0.0149	0.0133	14.2662	9.0314
0.0	0.20	0.20	57.59	80.53	0.2872	0.3012	0.68	0.38	0.0119	0.9543	0.0024	0.0023	1.9123	1.1769
0.0	0.20	0.50	87.10	94.79	0.3113	0.3256	-2.02	-1.18	-0.0314	0.9199	0.0071	0.0059	6.6957	4.0836
0.0	0.20	0.80	96.22	98.52	0.3211	0.3332	-4.22	-1.65	-0.0437	0.9275	0.0074	0.0056	6.9665	4.2533
0.0	0.50	0.50	90.16	96.07	0.3047	0.3209	0.24	0.10	0.0023	0.9899	0.0005	0.0003	0.4480	0.2541
0.0	0.50	0.80	99.68	99.89	0.3148	0.3278	-0.76	-0.29	-0.0067	0.9899	0.0011	0.0002	1.0132	0.6802
0.0	0.80	0.80	100.53	100.20	0.3139	0.3277	0.09	0.03	0.0006	0.9962	0.0002	0.0001	0.1467	0.0823

Exhibit A-8 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
THETA = 90.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	92.06	96.85	0.3396	0.3499	-2.52	-1.02	-0.0256	0.9029	0.0061	0.0063	5.5995	3.7918
1.0	0.02	0.05	85.37	94.05	0.3463	0.3554	-5.46	-2.29	-0.0584	0.8120	0.0134	0.0133	11.7181	7.9344
1.0	0.02	0.10	78.62	91.07	0.3490	0.3563	-6.84	-3.02	-0.0734	0.7716	0.0175	0.0169	14.7377	10.0732
1.0	0.02	0.20	71.36	87.67	0.3450	0.3510	-6.02	-2.83	-0.0759	0.7691	0.0173	0.0172	14.5967	9.9749
1.0	0.02	0.50	60.62	82.19	0.3329	0.3397	-4.86	-2.56	-0.0710	0.7650	0.0173	0.0182	14.7941	9.8956
1.0	0.02	0.80	57.07	80.24	0.3257	0.3348	-4.51	-2.47	-0.0692	0.7626	0.0172	0.0188	15.0305	9.8915
1.0	0.05	0.05	86.48	94.52	0.3434	0.3524	-4.35	-1.82	-0.0465	0.8523	0.0104	0.0103	9.2315	6.2581
1.0	0.05	0.10	79.15	90.36	0.3492	0.3558	-7.31	-3.23	-0.0845	0.7953	0.0176	0.0164	14.7166	9.9909
1.0	0.05	0.20	70.36	87.19	0.3462	0.3511	-7.02	-3.32	-0.0897	0.7732	0.0185	0.0173	15.2812	10.2573
1.0	0.05	0.50	59.91	81.81	0.3339	0.3397	-5.57	-2.94	-0.0826	0.7725	0.0182	0.0183	15.2977	10.0905
1.0	0.05	0.80	56.45	79.89	0.3266	0.3350	-5.13	-2.82	-0.0793	0.7694	0.0182	0.0189	15.5476	10.1402
1.0	0.10	0.10	80.97	92.13	0.3415	0.3485	-4.49	-1.96	-0.0519	0.8331	0.0100	0.0091	8.5973	5.8220
1.0	0.10	0.20	70.55	87.28	0.3427	0.3464	-6.83	-3.23	-0.0838	0.8034	0.0150	0.0125	12.1733	8.1012
1.0	0.10	0.50	60.26	81.99	0.3300	0.3346	-5.23	-2.75	-0.0790	0.8009	0.0144	0.0132	11.9604	7.7371
1.0	0.10	0.80	56.84	80.11	0.3228	0.3298	-4.74	-2.60	-0.0753	0.8070	0.0144	0.0133	12.1641	7.8824
1.0	0.20	0.20	74.43	89.14	0.3327	0.3375	-2.95	-1.37	-0.0389	0.9613	0.0050	0.0036	4.1776	2.7583
1.0	0.20	0.50	61.83	82.34	0.3223	0.3261	-3.66	-1.91	-0.0572	0.9479	0.0067	0.0047	5.5756	3.6230
1.0	0.20	0.80	58.41	80.98	0.3152	0.3211	-3.17	-1.72	-0.0521	0.9492	0.0067	0.0051	5.6699	3.6158
1.0	0.50	0.50	64.62	84.30	0.3159	0.3210	-0.87	-0.45	-0.0142	1.0051	0.0003	-0.0004	0.6256	0.5447
1.0	0.50	0.80	60.51	82.13	0.3088	0.3155	-1.07	-0.57	-0.0187	1.0056	0.0004	-0.0006	0.8119	0.7022
1.0	0.80	0.80	61.31	82.56	0.3083	0.3157	-0.27	-0.14	-0.0047	1.0044	-0.0002	-0.0003	0.2341	0.2042
0.3	0.02	0.02	31.02	62.56	0.3282	0.3376	-0.51	-0.43	-0.0152	0.9193	0.0054	0.0057	3.3609	2.3450
0.3	0.02	0.05	33.42	64.53	0.3232	0.3318	-1.27	-1.01	-0.0345	0.8633	0.0110	0.0116	7.4203	5.0121
0.3	0.02	0.10	37.05	67.34	0.3175	0.3264	-2.10	-1.55	-0.0502	0.7950	0.0149	0.0163	11.1803	7.3443
0.3	0.02	0.20	42.90	71.51	0.3121	0.3229	-2.88	-1.91	-0.0570	0.7674	0.0163	0.0187	13.6569	8.8035
0.3	0.02	0.50	51.27	76.36	0.3137	0.3272	-3.92	-2.31	-0.0656	0.7577	0.0170	0.0196	15.2416	9.8642
0.3	0.02	0.80	53.90	78.43	0.3170	0.3305	-4.22	-2.40	-0.0673	0.7585	0.0171	0.0194	15.2705	9.9231
0.3	0.05	0.05	33.72	64.77	0.3204	0.3288	-0.97	-0.77	-0.0264	0.8832	0.0082	0.0086	5.5793	3.7896
0.3	0.05	0.10	37.13	67.40	0.3162	0.3242	-2.03	-1.49	-0.0493	0.8259	0.0135	0.0141	9.2205	6.3093
0.3	0.05	0.20	42.69	71.37	0.3122	0.3222	-3.09	-2.06	-0.0663	0.7813	0.0164	0.0180	13.4243	8.6973
0.3	0.05	0.50	50.30	76.58	0.3146	0.3274	-4.39	-2.59	-0.0746	0.7633	0.0180	0.0193	15.3300	10.1204
0.3	0.05	0.80	53.36	78.11	0.3180	0.3307	-4.76	-2.72	-0.0774	0.7641	0.0181	0.0196	15.3977	10.2213
0.3	0.10	0.10	38.10	68.12	0.3092	0.3166	-1.06	-0.77	-0.0261	0.9196	0.0066	0.0063	4.3506	3.1063
0.3	0.10	0.20	43.29	71.78	0.3074	0.3157	-2.48	-1.65	-0.0524	0.8599	0.0116	0.0113	9.3966	5.9959
0.3	0.10	0.50	51.27	76.36	0.3108	0.3220	-3.92	-2.31	-0.0669	0.8299	0.0141	0.0144	12.2403	7.7559
0.3	0.10	0.80	53.79	78.36	0.3143	0.3255	-4.33	-2.46	-0.0713	0.8304	0.0144	0.0144	12.4273	7.9031
0.3	0.20	0.20	45.09	72.98	0.2985	0.3063	-0.68	-0.45	-0.0151	0.9729	0.0027	0.0022	2.1073	1.2848
0.3	0.20	0.50	52.84	77.30	0.3032	0.3131	-2.35	-1.37	-0.0424	0.9350	0.0066	0.0053	5.5909	3.4629
0.3	0.20	0.80	55.36	79.27	0.3068	0.3167	-2.76	-1.56	-0.0475	0.9353	0.0069	0.0056	5.8773	3.6703
0.3	0.50	0.50	55.00	79.06	0.2970	0.3076	-0.19	-0.11	-0.0033	0.9977	0.0003	0.0000	0.2943	0.1920
0.3	0.50	0.80	57.46	80.45	0.3006	0.3111	-0.66	-0.37	-0.0124	0.9972	0.0007	-0.0001	0.7453	0.5418
0.3	0.80	0.80	58.07	80.79	0.2999	0.3110	-0.05	-0.03	-0.0011	0.9995	0.0000	-0.0001	0.0696	0.0559

Exhibit A-8 (continued)

0.0	0.02	0.02	4.86	26.38	0.2585	0.2638	0.35	1.04	0.0732	0.9468	0.0070	0.0084	1.8967	1.8220
0.0	0.02	0.05	11.15	39.88	0.2650	0.2725	0.52	0.89	0.0630	0.7934	0.0104	0.0132	5.0735	3.7858
0.0	0.02	0.10	19.24	51.00	0.2734	0.2846	-0.08	-0.09	0.0020	0.7561	0.0133	0.0150	9.6858	6.4295
0.0	0.02	0.20	30.79	62.28	0.2841	0.2990	-1.53	-1.28	-0.0895	0.7469	0.0157	0.0204	13.5577	8.6295
0.0	0.02	0.50	47.26	74.38	0.3038	0.3203	-3.52	-2.19	-0.0625	0.7517	0.0169	0.0203	15.4766	9.2434
0.0	0.02	0.80	52.55	77.63	0.3130	0.3236	-4.09	-2.37	-0.0667	0.7561	0.0171	0.0197	15.8905	9.2853
0.0	0.05	0.05	11.11	39.69	0.2620	0.2686	0.48	0.81	0.0479	0.8455	0.0074	0.0092	3.4665	2.5969
0.0	0.05	0.10	19.55	51.36	0.2715	0.2815	0.24	0.27	0.0172	0.7851	0.0119	0.0149	7.9610	5.2555
0.0	0.05	0.20	30.82	62.39	0.2840	0.2981	-1.41	-1.17	-0.0865	0.7572	0.0156	0.0194	13.0299	8.3203
0.0	0.05	0.50	46.89	74.14	0.3047	0.3210	-3.88	-2.42	-0.0703	0.7557	0.0173	0.0205	15.9753	10.1714
0.0	0.05	0.80	52.03	77.32	0.3141	0.3288	-4.60	-2.67	-0.0762	0.7610	0.0181	0.0199	15.9542	10.2568
0.0	0.10	0.10	19.72	51.56	0.2647	0.2727	0.41	0.47	0.0227	0.8065	0.0051	0.0062	3.1579	2.1174
0.0	0.10	0.20	31.61	63.03	0.2791	0.2911	-0.62	-0.51	-0.0154	0.8313	0.0106	0.0124	8.5677	5.3241
0.0	0.10	0.50	47.42	74.48	0.3010	0.3156	-3.36	-2.09	-0.0621	0.8205	0.0141	0.0151	12.4399	7.7017
0.0	0.10	0.80	52.48	77.59	0.3104	0.3235	-4.15	-2.40	-0.0703	0.8266	0.0144	0.0147	12.5403	7.9455
0.0	0.20	0.20	32.52	63.89	0.2706	0.2809	0.29	0.24	0.0091	0.9583	0.0021	0.0022	1.4534	0.9117
0.0	0.20	0.50	48.99	75.47	0.2935	0.3065	-1.79	-1.10	-0.0344	0.9249	0.0066	0.0061	5.7105	3.4673
0.0	0.20	0.80	54.05	78.51	0.3030	0.3147	-2.58	-1.48	-0.0454	0.9303	0.0070	0.0058	5.9304	3.7026
0.0	0.50	0.50	50.88	76.63	0.2874	0.3008	0.10	0.06	0.0018	0.9912	0.0005	0.0003	0.3109	0.1858
0.0	0.50	0.80	56.15	79.72	0.2969	0.3091	-0.49	-0.23	-0.0095	0.9919	0.0009	0.0002	0.7215	0.5142
0.0	0.80	0.80	56.67	80.01	0.2961	0.3089	0.04	0.02	0.0005	0.9967	0.0001	0.0001	0.1007	0.0640

Exhibit A-8 (continued)

PLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS
PERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS
FOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES
1600 MW POWER PLANT

DOWNWIND DISTANCE (KM) = 240.0
THETA = 135.

REFLECT	RP/RV0	RO/RV0	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
1.0	0.02	0.02	92.36	96.97	0.3389	0.3492	-2.55	-1.03	-0.0257	0.9036	0.0060	0.0063	5.6103	3.7041
1.0	0.02	0.05	86.04	94.33	0.3446	0.3537	-5.56	-2.32	-0.0586	0.8147	0.0132	0.0132	11.7541	7.9753
1.0	0.02	0.10	79.82	91.61	0.3460	0.3536	-7.04	-3.07	-0.0787	0.7744	0.0173	0.0169	14.9778	10.1345
1.0	0.02	0.20	73.37	88.63	0.3406	0.3476	-6.33	-2.92	-0.0766	0.7695	0.0172	0.0175	15.0998	10.1106
1.0	0.02	0.50	63.76	83.36	0.3275	0.3363	-5.32	-2.70	-0.0727	0.7642	0.0172	0.0137	15.5514	10.1959
1.0	0.02	0.80	60.56	82.16	0.3206	0.3320	-5.01	-2.63	-0.0712	0.7621	0.0171	0.0192	15.7920	10.2510
1.0	0.05	0.05	87.17	94.82	0.3416	0.3503	-4.42	-1.84	-0.0466	0.8556	0.0103	0.0103	9.2319	6.2823
1.0	0.05	0.10	79.56	91.41	0.3460	0.3539	-7.49	-3.28	-0.0845	0.7915	0.0172	0.0162	14.7719	9.9645
1.0	0.05	0.20	72.33	88.15	0.3416	0.3475	-7.34	-3.41	-0.0901	0.7709	0.0182	0.0174	15.6285	10.4107
1.0	0.05	0.50	63.09	83.46	0.3284	0.3364	-6.08	-3.10	-0.0843	0.7721	0.0181	0.0187	16.0485	10.6751
1.0	0.05	0.80	59.87	81.79	0.3215	0.3321	-5.70	-3.00	-0.0822	0.7692	0.0180	0.0193	16.3141	10.8501
1.0	0.10	0.10	82.28	92.71	0.3384	0.3456	-4.57	-1.98	-0.0517	0.8376	0.0096	0.0089	8.4319	5.6093
1.0	0.10	0.20	72.62	88.23	0.3378	0.3424	-7.08	-3.28	-0.0883	0.8322	0.0145	0.0134	12.2595	8.0827
1.0	0.10	0.50	63.40	83.67	0.3245	0.3311	-5.68	-2.89	-0.0806	0.8413	0.0142	0.0135	12.6865	8.0539
1.0	0.10	0.80	60.31	82.03	0.3177	0.3269	-5.25	-2.76	-0.0773	0.8373	0.0142	0.0140	12.7833	8.1259
1.0	0.20	0.20	76.69	90.19	0.3289	0.3335	-3.01	-1.37	-0.0381	0.9643	0.0047	0.0034	4.0431	2.6583
1.0	0.20	0.50	65.16	84.58	0.3163	0.3223	-3.93	-1.98	-0.0575	0.9439	0.0065	0.0047	5.7277	3.7955
1.0	0.20	0.80	62.07	82.97	0.3101	0.3159	-3.50	-1.82	-0.0533	0.9448	0.0066	0.0051	5.8334	3.7842
1.0	0.50	0.50	63.20	86.12	0.3103	0.3172	-0.88	-0.44	-0.0136	1.0053	0.0002	-0.0004	0.5963	0.5292
1.0	0.50	0.80	64.42	84.29	0.3033	0.3123	-1.15	-0.59	-0.0185	1.0072	0.0003	-0.0006	0.8130	0.7102
1.0	0.80	0.80	65.30	84.93	0.3033	0.3125	-0.27	-0.14	-0.0044	1.0045	-0.0002	-0.0003	0.2425	0.1927
0.3	0.02	0.02	31.31	62.88	0.3263	0.3353	-0.55	-0.46	-0.0157	0.9292	0.0053	0.0057	3.0955	2.3570
0.3	0.02	0.05	34.09	65.06	0.3193	0.3286	-1.37	-1.07	-0.0356	0.8505	0.0107	0.0116	7.5305	5.0560
0.3	0.02	0.10	33.25	60.23	0.3131	0.3226	-2.30	-1.65	-0.0519	0.7966	0.0146	0.0163	11.4493	7.4065
0.3	0.02	0.20	44.90	72.85	0.3072	0.3192	-3.19	-2.05	-0.0600	0.7673	0.0160	0.0190	14.3520	9.1925
0.3	0.02	0.50	54.41	78.72	0.3089	0.3243	-4.38	-2.47	-0.0679	0.7577	0.0168	0.0199	15.9793	10.2541
0.3	0.02	0.80	57.39	80.42	0.3123	0.3279	-4.72	-2.57	-0.0698	0.7534	0.0169	0.0197	16.0259	10.3139
0.3	0.05	0.05	34.41	65.32	0.3170	0.3256	-1.05	-0.81	-0.0272	0.8903	0.0080	0.0085	5.6205	3.7446
0.3	0.05	0.10	33.34	60.30	0.3116	0.3203	-2.21	-1.59	-0.0507	0.8273	0.0131	0.0140	10.1579	6.5794
0.3	0.05	0.20	44.67	72.70	0.3073	0.3184	-3.42	-2.20	-0.0654	0.7826	0.0161	0.0181	14.0927	8.9365
0.3	0.05	0.50	53.89	78.41	0.3098	0.3244	-4.90	-2.78	-0.0772	0.7633	0.0177	0.0200	16.4665	10.5064
0.3	0.05	0.80	56.73	80.07	0.3133	0.3281	-5.33	-2.91	-0.0809	0.7644	0.0179	0.0199	16.5764	10.6171
0.3	0.10	0.10	39.41	69.07	0.3047	0.3126	-1.14	-0.82	-0.0266	0.9234	0.0062	0.0063	4.8416	3.0796
0.3	0.10	0.20	45.36	73.15	0.3024	0.3117	-2.73	-1.75	-0.0538	0.8615	0.0112	0.0115	9.5846	6.0973
0.3	0.10	0.50	54.41	78.72	0.3059	0.3189	-4.38	-2.47	-0.0703	0.8310	0.0139	0.0146	12.7626	8.0236
0.3	0.10	0.80	57.26	80.35	0.3095	0.3227	-4.84	-2.64	-0.0743	0.8315	0.0142	0.0145	12.9724	8.1954
0.3	0.20	0.20	47.35	74.44	0.2936	0.3023	-0.74	-0.47	-0.0151	0.9747	0.0025	0.0020	2.0567	1.2492
0.3	0.20	0.50	56.17	79.73	0.2984	0.3098	-2.62	-1.47	-0.0437	0.9367	0.0063	0.0053	5.7619	3.5551
0.3	0.20	0.80	59.02	81.32	0.3021	0.3138	-3.09	-1.67	-0.0491	0.9369	0.0067	0.0056	6.0310	3.7041
0.3	0.50	0.50	58.58	81.08	0.2923	0.3043	-0.20	-0.11	-0.0038	0.9933	0.0003	-0.0000	0.2616	0.1822
0.3	0.50	0.80	61.37	82.59	0.2960	0.3081	-0.74	-0.39	-0.0128	0.9932	0.0007	-0.0001	0.7460	0.5523
0.3	0.80	0.80	62.03	82.96	0.2954	0.3081	-0.06	-0.03	-0.0011	0.9993	0.0000	-0.0001	0.0646	0.0503

Exhibit A-8 (continued)

0.0	0.02	0.02	5.15	27.21	0.2545	0.2596	0.31	0.89	0.0689	0.8513	0.0064	0.0031	1.8818	1.7671
0.0	0.02	0.05	11.82	40.93	0.2609	0.2691	0.42	0.69	0.0434	0.8994	0.0093	0.0129	5.2069	3.7702
0.0	0.02	0.10	20.44	52.36	0.2692	0.2813	-0.27	-0.30	-0.0042	0.7610	0.0133	0.0179	10.0539	6.6210
0.0	0.02	0.20	32.70	63.95	0.2799	0.2961	-1.84	-1.47	-0.0433	0.7492	0.0152	0.0204	14.1455	9.0229
0.0	0.02	0.50	50.40	76.34	0.2994	0.3181	-3.98	-2.36	-0.0653	0.7523	0.0166	0.0205	16.1991	10.3050
0.0	0.02	0.80	56.03	79.65	0.3035	0.3260	-4.59	-2.54	-0.0691	0.7563	0.0169	0.0200	16.1231	10.3450
0.0	0.05	0.05	11.89	40.94	0.2580	0.2652	0.40	0.65	0.0394	0.8518	0.0069	0.0039	3.5321	2.5983
0.0	0.05	0.10	20.76	52.73	0.2673	0.2781	0.06	0.06	0.0097	0.7920	0.0113	0.0147	8.2917	5.3682
0.0	0.05	0.20	32.81	64.04	0.2797	0.2950	-1.73	-1.33	-0.0413	0.7606	0.0151	0.0194	13.6233	8.6042
0.0	0.05	0.50	49.98	76.08	0.3093	0.3183	-4.40	-2.62	-0.0734	0.7569	0.0175	0.0207	16.6935	10.5537
0.0	0.05	0.80	55.46	79.32	0.3095	0.3262	-5.17	-2.87	-0.0790	0.7617	0.0178	0.0202	16.6943	10.6492
0.0	0.10	0.10	21.03	53.02	0.2607	0.2694	0.32	0.36	0.0182	0.9011	0.0048	0.0060	3.1992	2.1159
0.0	0.10	0.20	33.67	64.73	0.2748	0.2879	-0.87	-0.69	-0.0200	0.8363	0.0102	0.0122	8.8273	5.4566
0.0	0.10	0.50	50.56	76.43	0.2965	0.3127	-3.82	-2.27	-0.0650	0.8225	0.0137	0.0152	12.9494	8.0611
0.0	0.10	0.80	55.96	79.61	0.3058	0.3209	-4.67	-2.59	-0.0729	0.8239	0.0142	0.0143	13.0862	8.2294
0.0	0.20	0.20	34.78	65.61	0.2666	0.2778	0.24	0.18	0.0073	0.9613	0.0019	0.0021	1.4347	0.8867
0.0	0.20	0.50	52.32	77.49	0.2891	0.3036	-2.06	-1.21	-0.0363	0.9265	0.0064	0.0060	5.8797	3.5582
0.0	0.20	0.80	57.71	80.60	0.2985	0.3119	-2.91	-1.60	-0.0472	0.9327	0.0063	0.0053	6.1796	3.8132
0.0	0.50	0.50	54.46	78.73	0.2832	0.2973	0.09	0.05	0.0014	0.9921	0.0004	0.0003	0.2863	0.1692
0.0	0.50	0.80	60.06	81.39	0.2925	0.3062	-0.57	-0.31	-0.0101	0.9932	0.0003	0.0001	0.7824	0.5204
0.0	0.80	0.80	60.66	82.21	0.2918	0.3061	0.03	0.02	0.0004	0.9970	0.0001	0.0001	0.0893	0.0535

Exhibit A-8 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 240.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
45.																
	20.	0.00	180.3	2.28	93.10	97.27	0.3486	0.3596	-12.06	-4.69	-0.1115	0.6393	0.0292	0.0284	27.0046	17.836
	20.	0.02	180.3	2.53	94.13	97.69	0.3445	0.3547	-11.06	-4.23	-0.1031	0.7097	0.0269	0.0235	23.1447	15.110
	20.	0.05	179.7	2.85	95.52	98.24	0.3395	0.3490	-9.72	-3.75	-0.0916	0.7760	0.0193	0.0177	18.6282	11.853
	20.	0.10	178.9	3.30	97.47	99.01	0.3335	0.3423	-7.85	-3.01	-0.0753	0.8390	0.0137	0.0110	12.6692	8.027
	20.	0.20	177.7	3.97	100.30	100.11	0.3268	0.3354	-5.14	-1.95	-0.0502	0.9362	0.0066	0.0040	6.1769	3.895
	20.	0.50	175.9	4.90	104.14	101.58	0.3213	0.3311	-1.49	-0.56	-0.0157	0.9883	0.0007	-0.0004	1.0160	0.784
	20.	0.80	175.4	5.13	105.25	101.99	0.3208	0.3312	-0.45	-0.17	-0.0049	1.0010	-0.0000	-0.0003	0.3068	0.257
	40.	0.00	182.1	1.55	86.32	94.45	0.3506	0.3654	-19.01	-7.57	-0.1823	0.5774	0.0407	0.0360	34.9830	23.040
	40.	0.02	180.5	2.41	87.89	95.12	0.3543	0.3588	-17.46	-6.91	-0.1699	0.6303	0.0363	0.0274	29.7556	19.359
	40.	0.05	178.4	3.55	90.02	96.01	0.3468	0.3512	-15.37	-6.04	-0.1503	0.7073	0.0268	0.0190	23.5202	15.002
	40.	0.10	175.5	5.13	92.99	97.23	0.3382	0.3428	-12.45	-4.84	-0.1223	0.8078	0.0139	0.0114	16.6990	10.234
	40.	0.20	171.3	7.42	97.33	98.96	0.3287	0.3346	-8.19	-3.14	-0.0835	0.9094	0.0033	0.0032	7.9033	5.166
	40.	0.50	165.5	10.54	103.25	101.24	0.3213	0.3304	-2.40	-0.90	-0.0253	1.0306	0.0006	-0.0011	1.5562	1.023
	40.	0.80	172.3	6.62	104.97	101.89	0.3207	0.3309	-0.73	-0.27	-0.0080	1.0022	-0.0002	-0.0006	0.5251	0.433
	60.	0.00	184.3	0.37	82.52	92.81	0.3637	0.3639	-22.93	-9.26	-0.2257	0.5720	0.0436	0.0325	30.8078	20.870
	60.	0.02	181.2	2.04	84.39	93.63	0.3566	0.3570	-21.08	-8.45	-0.2087	0.6470	0.0364	0.0256	30.0360	20.091
	60.	0.05	177.1	4.25	86.91	94.71	0.3484	0.3493	-18.58	-7.33	-0.1856	0.7362	0.0281	0.0179	24.2275	15.617
	60.	0.10	171.5	7.29	90.45	96.19	0.3389	0.3410	-15.03	-5.91	-0.1526	0.8391	0.0186	0.0096	16.6122	10.711
	60.	0.20	163.5	11.64	95.62	98.28	0.3288	0.3332	-9.96	-3.83	-0.1032	0.9436	0.0092	0.0017	8.2228	5.609
	60.	0.50	152.6	17.50	102.72	101.04	0.3211	0.3299	-2.96	-1.11	-0.0319	1.0229	0.0003	-0.0016	1.8798	1.508
	60.	0.80	172.8	6.53	104.81	101.83	0.3205	0.3308	-0.91	-0.34	-0.0099	1.0033	-0.0003	-0.0003	0.6663	0.543
	80.	0.00	184.3	0.12	80.56	91.94	0.3639	0.3618	-24.97	-10.16	-0.2487	0.5747	0.0435	0.0304	35.9755	23.615
	80.	0.02	180.1	2.64	82.58	92.84	0.3566	0.3551	-22.97	-9.37	-0.2299	0.6502	0.0362	0.0237	30.6993	19.998
	80.	0.05	174.0	5.97	85.30	94.02	0.3482	0.3476	-20.26	-8.09	-0.2045	0.7499	0.0277	0.0161	23.9316	15.530
	80.	0.10	165.5	10.53	89.13	95.64	0.3386	0.3395	-16.46	-6.48	-0.1681	0.8731	0.0189	0.0080	16.3328	10.762
	80.	0.20	153.5	17.02	94.72	97.92	0.3283	0.3322	-10.91	-4.21	-0.1137	0.9671	0.0077	0.0037	8.2499	5.577
	80.	0.50	152.8	17.39	102.44	100.93	0.3209	0.3296	-3.26	-1.23	-0.0351	1.0240	0.0001	-0.0019	2.0462	1.747
	80.	0.80	172.9	6.56	104.71	101.79	0.3205	0.3307	-1.01	-0.38	-0.0109	1.0043	-0.0004	-0.0009	0.7565	0.603
	100.	0.00	182.7	1.23	79.60	91.51	0.3634	0.3607	-26.02	-10.61	-0.2592	0.5773	0.0423	0.0292	35.4309	23.230
	100.	0.02	176.5	4.58	81.69	92.44	0.3561	0.3540	-23.92	-9.68	-0.2404	0.6535	0.0353	0.0225	30.0256	19.609
	100.	0.05	168.4	8.99	84.50	93.67	0.3476	0.3466	-21.11	-8.46	-0.2137	0.7435	0.0271	0.0151	23.5479	15.295
	100.	0.10	157.2	15.02	88.47	95.35	0.3381	0.3387	-17.17	-6.78	-0.1750	0.8457	0.0174	0.0072	16.0597	10.703
	100.	0.20	141.4	23.53	94.27	97.74	0.3280	0.3316	-11.39	-4.41	-0.1163	0.9503	0.0073	0.0001	8.1202	5.980
	100.	0.50	153.0	17.31	102.29	100.88	0.3207	0.3294	-3.42	-1.29	-0.0367	1.0255	-0.0001	-0.0021	2.1280	1.822
	100.	0.80	172.9	6.55	104.66	101.77	0.3204	0.3306	-1.07	-0.40	-0.0114	1.0031	-0.0005	-0.0009	0.8027	0.694
	120.	0.00	177.4	4.03	79.11	91.29	0.3629	0.3601	-26.52	-10.84	-0.2653	0.5704	0.0433	0.0285	35.0160	23.134
	120.	0.02	169.3	8.20	81.24	92.24	0.3556	0.3535	-24.41	-9.90	-0.2454	0.6563	0.0360	0.0220	29.6022	19.497
	120.	0.05	159.8	13.63	84.10	93.50	0.3472	0.3461	-21.55	-8.64	-0.2182	0.7564	0.0265	0.0146	23.2041	15.257
	120.	0.10	146.1	21.05	88.13	95.22	0.3377	0.3383	-17.53	-6.93	-0.1794	0.8696	0.0170	0.0063	15.7246	10.442
	120.	0.20	139.9	24.39	94.04	97.65	0.3277	0.3314	-11.65	-4.51	-0.1213	0.9529	0.0069	-0.0001	7.9909	5.955
	120.	0.50	153.0	17.28	102.21	100.85	0.3206	0.3293	-3.51	-1.32	-0.0375	1.0273	-0.0003	-0.0022	2.1563	1.853
	120.	0.80	172.9	6.54	104.63	101.76	0.3203	0.3306	-1.10	-0.41	-0.0116	1.0057	-0.0006	-0.0009	0.8302	0.651
	140.	0.00	168.4	8.99	78.87	91.18	0.3625	0.3598	-26.89	-10.96	-0.2673	0.5724	0.0418	0.0283	34.7275	22.992
	140.	0.02	159.4	13.85	81.01	92.14	0.3553	0.3532	-24.66	-10.01	-0.2477	0.6585	0.0346	0.0217	29.3369	19.404
	140.	0.05	148.2	19.89	83.90	93.41	0.3469	0.3459	-21.73	-8.74	-0.2202	0.7637	0.0262	0.0144	22.9663	15.167
	140.	0.10	143.1	22.64	87.96	95.15	0.3374	0.3381	-17.73	-7.01	-0.1811	0.8720	0.0167	0.0066	15.6057	10.393
	140.	0.20	140.1	24.29	93.92	97.60	0.3275	0.3313	-11.78	-4.56	-0.1225	0.9550	0.0067	-0.0003	7.8365	5.941
	140.	0.50	153.1	17.26	102.17	100.83	0.3205	0.3293	-3.56	-1.34	-0.0379	1.0293	-0.0003	-0.0022	2.1697	1.896
	140.	0.80	172.9	6.54	104.62	101.76	0.3203	0.3306	-1.11	-0.42	-0.0117	1.0062	-0.0006	-0.0009	0.8459	0.659
	160.	0.00	156.7	15.30	78.75	91.13	0.3623	0.3597	-26.94	-11.03	-0.2689	0.5741	0.0415	0.0282	34.5406	22.913

Exhibit A-8 (continued)

160.	0.02	152.7	17.47	80.90	92.09	0.3331	0.3331	-24.79	-10.05	-0.2437	0.6603	0.0343	0.0216	29.1623	19.652
160.	0.05	143.4	19.76	83.89	93.37	0.3467	0.3458	-21.90	-8.79	-0.2211	0.7306	0.0259	0.0143	22.0121	15.103
160.	0.10	143.3	22.56	87.83	95.11	0.3373	0.3381	-17.83	-7.05	-0.1810	0.8333	0.0163	0.0066	15.4799	10.542
160.	0.20	140.1	24.25	93.86	97.58	0.3274	0.3312	-11.85	-4.59	-0.1239	0.9766	0.0066	-0.0003	7.8125	5.225
160.	0.50	153.1	17.26	102.14	100.82	0.3205	0.3293	-3.58	-1.35	-0.0330	1.0407	-0.0004	-0.0022	2.1740	1.571
160.	0.80	172.9	6.54	104.61	101.75	0.3203	0.3306	-1.12	-0.42	-0.0110	1.0256	-0.0005	-0.0009	0.8540	0.664
180.	0.00	156.9	15.23	78.69	91.10	0.3622	0.3596	-27.01	-11.06	-0.2696	0.5934	0.0414	0.0231	34.6609	22.654
180.	0.02	152.3	17.41	80.84	92.07	0.3549	0.3531	-24.85	-10.09	-0.2491	0.6647	0.0341	0.0215	28.9568	19.[illegible]
180.	0.05	143.5	19.71	83.74	93.35	0.3466	0.3458	-21.96	-8.83	-0.2215	0.7523	0.0253	0.0142	22.7456	15.[illegible]
180.	0.10	143.3	22.53	87.83	95.10	0.3372	0.3380	-17.83	-7.07	-0.1821	0.8753	0.0163	0.0065	15.8998	10.514
180.	0.20	140.2	24.23	93.83	97.56	0.3273	0.3312	-11.82	-4.60	-0.1238	0.9839	0.0065	-0.0003	7.7685	5.211
180.	0.50	153.1	17.25	102.13	100.82	0.3205	0.3293	-3.60	-1.35	-0.0331	1.0403	-0.0004	-0.0022	2.1745	1.570
180.	0.80	172.9	6.54	104.61	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0253	-0.0005	-0.0009	0.8541	0.664
200.	0.00	156.9	15.20	78.66	91.09	0.3621	0.3596	-27.05	-11.03	-0.2695	0.5936	0.0413	0.0231	34.6625	22.652
200.	0.02	152.3	17.33	80.81	92.06	0.3549	0.3531	-24.89	-10.11	-0.2492	0.6643	0.0340	0.0215	28.9609	19.[illegible]
200.	0.05	143.6	19.69	83.72	93.34	0.3465	0.3457	-22.00	-8.83	-0.2216	0.7522	0.0252	0.0142	22.7571	15.[illegible]
200.	0.10	143.3	22.51	87.81	95.09	0.3371	0.3380	-17.91	-7.05	-0.1820	0.8765	0.0163	0.0065	15.8594	10.[illegible]
200.	0.20	140.2	24.23	93.81	97.56	0.3273	0.3312	-11.91	-4.61	-0.1238	0.9839	0.0064	-0.0003	7.7806	5.[illegible]
200.	0.50	153.1	17.25	102.13	100.82	0.3205	0.3293	-3.60	-1.35	-0.0331	1.0402	-0.0004	-0.0022	2.1741	1.[illegible]
200.	0.80	172.9	6.54	104.61	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0252	-0.0005	-0.0010	0.8542	0.[illegible]
220.	0.00	156.9	15.20	78.65	91.08	0.3621	0.3596	-27.07	-11.02	-0.2695	0.5937	0.0412	0.0231	34.6644	22.651
220.	0.02	152.9	17.38	80.80	92.05	0.3548	0.3530	-24.92	-10.12	-0.2493	0.6639	0.0340	0.0215	28.9558	19.[illegible]
220.	0.05	143.6	19.69	83.71	93.33	0.3465	0.3457	-22.01	-8.83	-0.2217	0.7521	0.0252	0.0142	22.7582	15.[illegible]
220.	0.10	143.4	22.51	87.80	95.08	0.3371	0.3380	-17.92	-7.09	-0.1823	0.8774	0.0162	0.0065	15.8412	10.[illegible]
220.	0.20	140.2	24.22	93.80	97.56	0.3273	0.3312	-11.92	-4.62	-0.1238	0.9837	0.0064	-0.0004	7.7815	5.[illegible]
220.	0.50	153.1	17.25	102.13	100.82	0.3205	0.3293	-3.61	-1.36	-0.0331	1.0113	-0.0003	-0.0022	2.1722	1.[illegible]
220.	0.80	172.9	6.54	104.60	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0074	-0.0006	-0.0010	0.8540	0.663
230.	0.00	156.9	15.19	78.64	91.09	0.3621	0.3596	-27.03	-11.09	-0.2696	0.5936	0.0412	0.0231	34.6432	22.642
230.	0.02	152.9	17.38	80.80	92.05	0.3548	0.3530	-24.92	-10.12	-0.2493	0.6639	0.0340	0.0215	28.9461	19.[illegible]
230.	0.05	148.6	19.69	83.71	93.33	0.3465	0.3457	-22.02	-8.83	-0.2217	0.7544	0.0256	0.0142	22.6165	15.031
230.	0.10	143.4	22.51	87.80	95.08	0.3371	0.3380	-17.93	-7.09	-0.1823	0.8577	0.0162	0.0065	15.3132	10.[illegible]
230.	0.20	140.2	24.22	93.80	97.55	0.3273	0.3312	-11.93	-4.62	-0.1238	0.9600	0.0064	-0.0004	7.7053	5.[illegible]
230.	0.50	153.1	17.25	102.13	100.82	0.3205	0.3293	-3.61	-1.36	-0.0331	1.0114	-0.0003	-0.0022	2.1720	1.[illegible]
230.	0.80	172.9	6.54	104.60	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0075	-0.0006	-0.0010	0.8540	0.663
235.	0.00	156.9	15.19	78.64	91.08	0.3621	0.3596	-27.03	-11.02	-0.2696	0.5936	0.0412	0.0231	34.6406	22.636
235.	0.02	152.9	17.38	80.80	92.05	0.3548	0.3530	-24.93	-10.12	-0.2493	0.6641	0.0339	0.0215	28.9423	19.[illegible]
235.	0.05	148.6	19.69	83.71	93.33	0.3465	0.3457	-22.02	-8.84	-0.2217	0.7546	0.0256	0.0142	22.6116	15.[illegible]
235.	0.10	143.4	22.51	87.80	95.08	0.3371	0.3380	-17.93	-7.09	-0.1823	0.8579	0.0162	0.0065	15.3110	10.[illegible]
235.	0.20	140.2	24.22	93.80	97.55	0.3273	0.3312	-11.93	-4.62	-0.1238	0.9601	0.0064	-0.0004	7.7032	5.[illegible]
235.	0.50	153.1	17.25	102.13	100.82	0.3204	0.3293	-3.61	-1.36	-0.0331	1.0115	-0.0003	-0.0022	2.1723	1.[illegible]
235.	0.80	172.9	6.54	104.60	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0075	-0.0006	-0.0010	0.8540	0.663
238.	0.00	156.9	15.19	78.64	91.08	0.3621	0.3596	-27.08	-11.09	-0.2696	0.5876	0.0412	0.0231	34.3090	22.615
238.	0.02	152.9	17.38	80.80	92.05	0.3548	0.3530	-24.93	-10.12	-0.2493	0.6641	0.0339	0.0215	28.9414	19.166
238.	0.05	148.6	19.68	83.71	93.33	0.3465	0.3457	-22.02	-8.84	-0.2217	0.7546	0.0256	0.0142	22.6102	15.031
238.	0.10	143.4	22.51	87.80	95.08	0.3371	0.3380	-17.93	-7.09	-0.1823	0.8579	0.0162	0.0065	15.3099	10.481
238.	0.20	140.2	24.22	93.80	97.55	0.3273	0.3312	-11.93	-4.62	-0.1238	0.9602	0.0064	-0.0004	7.7030	5.[illegible]
238.	0.50	153.1	17.25	102.13	100.82	0.3204	0.3293	-3.61	-1.36	-0.0331	1.0115	-0.0003	-0.0022	2.1727	1.[illegible]
238.	0.80	172.9	6.54	104.60	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0075	-0.0006	-0.0010	0.8540	0.663
239.	0.00	156.9	15.19	78.64	91.08	0.3621	0.3596	-27.08	-11.09	-0.2696	0.5876	0.0412	0.0231	34.3085	22.615
239.	0.02	152.9	17.38	80.80	92.05	0.3548	0.3530	-24.93	-10.12	-0.2493	0.6641	0.0339	0.0215	28.9409	19.164
239.	0.05	148.6	19.68	83.71	93.33	0.3465	0.3457	-22.02	-8.84	-0.2217	0.7547	0.0256	0.0142	22.6099	15.031
239.	0.10	143.4	22.51	87.80	95.08	0.3371	0.3380	-17.93	-7.09	-0.1823	0.8580	0.0162	0.0065	15.3095	10.480
239.	0.20	140.2	24.22	93.80	97.55	0.3273	0.3312	-11.93	-4.62	-0.1238	0.9602	0.0064	-0.0004	7.7027	5.[illegible]
239.	0.50	153.1	17.25	102.13	100.82	0.3204	0.3293	-3.61	-1.36	-0.0331	1.0115	-0.0003	-0.0022	2.1726	1.[illegible]
239.	0.80	172.9	6.54	104.60	101.75	0.3203	0.3306	-1.13	-0.42	-0.0110	1.0075	-0.0006	-0.0010	0.8650	0.663

Exhibit A-8 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 240.0
THETA = 90.

LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
20.	0.00	181.1	2.11	52.16	77.40	0.3309	0.3439	-7.34	-4.18	-0.1176	0.6416	0.0288	0.0306	24.0296	15.809
20.	0.02	180.6	2.36	52.77	77.76	0.3266	0.3385	-6.73	-3.82	-0.1088	0.7037	0.0245	0.0252	20.5118	13.350
20.	0.05	180.0	2.71	53.59	78.24	0.3215	0.3321	-5.91	-3.34	-0.0967	0.7777	0.0193	0.0189	16.2279	10.424
20.	0.10	179.1	3.19	54.74	78.91	0.3154	0.3248	-4.77	-2.68	-0.0796	0.8632	0.0132	0.0116	11.6385	7.093
20.	0.20	177.8	3.89	56.40	79.86	0.3087	0.3173	-3.12	-1.73	-0.0538	0.9503	0.0062	0.0041	5.2321	3.332
20.	0.50	176.0	4.88	58.63	81.11	0.3032	0.3127	-0.90	-0.49	-0.0167	1.0011	0.0003	-0.0003	0.8141	0.679
20.	0.80	175.4	5.17	59.27	81.46	0.3027	0.3128	-0.27	-0.15	-0.0052	1.0021	-0.0001	-0.0004	0.2650	0.227
40.	0.00	183.3	0.92	47.96	74.82	0.3423	0.3501	-11.54	-6.76	-0.1929	0.5827	0.0400	0.0368	30.7591	20.228
40.	0.02	181.6	1.83	48.91	75.42	0.3358	0.3427	-10.60	-6.17	-0.1784	0.6569	0.0334	0.0295	26.0322	16.919
40.	0.05	179.4	3.04	50.18	76.20	0.3282	0.3343	-9.33	-5.39	-0.1586	0.7450	0.0258	0.0211	20.4198	13.099
40.	0.10	176.3	4.73	51.97	77.28	0.3195	0.3252	-7.55	-4.31	-0.1305	0.8463	0.0170	0.0120	13.7782	8.783
40.	0.20	171.8	7.15	54.56	78.81	0.3102	0.3164	-4.96	-2.79	-0.0882	0.9485	0.0076	0.0031	6.5636	4.371
40.	0.50	165.6	10.46	58.08	80.80	0.3031	0.3120	-1.45	-0.80	-0.0273	1.0050	0.0004	-0.0013	1.2772	1.109
40.	0.80	172.8	6.61	59.10	81.36	0.3025	0.3126	-0.44	-0.24	-0.0084	1.0043	-0.0003	-0.0007	0.4599	0.383
60.	0.00	186.6	-0.88	45.62	73.32	0.3449	0.3482	-13.90	-8.27	-0.2383	0.5397	0.0424	0.0350	31.6601	20.768
60.	0.02	183.3	0.90	46.74	74.05	0.3376	0.3406	-12.77	-7.54	-0.2203	0.6572	0.0351	0.0274	26.7071	17.386
60.	0.05	179.0	3.26	48.26	75.01	0.3293	0.3321	-11.26	-6.58	-0.1960	0.7478	0.0267	0.0189	20.8392	13.459
60.	0.10	173.0	6.51	50.40	76.33	0.3198	0.3230	-9.13	-5.26	-0.1612	0.8516	0.0173	0.0098	14.0158	9.133
60.	0.20	164.4	11.14	53.50	78.19	0.3099	0.3147	-6.03	-3.41	-0.1090	0.9550	0.0073	0.0014	6.7780	4.795
60.	0.50	152.9	17.36	57.76	80.62	0.3028	0.3114	-1.78	-0.98	-0.0337	1.0090	0.0000	-0.0019	1.5665	1.382
60.	0.80	172.9	6.57	59.00	81.31	0.3024	0.3124	-0.55	-0.30	-0.0104	1.0063	-0.0004	-0.0009	0.5899	0.489
80.	0.00	188.3	-1.78	44.40	72.52	0.3446	0.3459	-15.12	-9.07	-0.2625	0.5853	0.0420	0.0327	31.1922	20.592
80.	0.02	183.3	0.93	45.62	73.32	0.3372	0.3384	-13.90	-8.27	-0.2427	0.6635	0.0346	0.0252	26.2435	17.197
80.	0.05	176.7	4.49	47.26	74.38	0.3287	0.3301	-12.26	-7.22	-0.2159	0.7548	0.0261	0.0169	20.4252	13.331
80.	0.10	167.7	9.37	49.57	75.83	0.3192	0.3213	-9.96	-5.77	-0.1775	0.8588	0.0165	0.0081	13.7121	9.147
80.	0.20	154.9	16.28	52.94	77.86	0.3093	0.3135	-6.59	-3.74	-0.1200	0.9615	0.0066	0.0003	6.7027	4.973
80.	0.50	153.0	17.30	57.58	80.52	0.3025	0.3110	-1.97	-1.09	-0.0371	1.0124	-0.0003	-0.0022	1.7299	1.525
80.	0.80	172.9	6.55	58.94	81.27	0.3023	0.3122	-0.61	-0.33	-0.0115	1.0079	-0.0003	-0.0010	0.6689	0.534
100.	0.00	187.3	-1.26	43.80	72.12	0.3438	0.3445	-15.73	-9.48	-0.2743	0.5915	0.0412	0.0313	30.6398	20.226
100.	0.02	180.7	2.32	45.06	72.96	0.3364	0.3371	-14.47	-8.64	-0.2537	0.6691	0.0337	0.0239	25.7517	16.913
100.	0.05	172.6	7.04	46.77	74.06	0.3279	0.3289	-12.77	-7.54	-0.2256	0.7607	0.0253	0.0157	19.9959	13.181
100.	0.10	160.0	13.49	49.16	75.57	0.3185	0.3204	-10.37	-6.03	-0.1855	0.8648	0.0158	0.0072	13.3964	9.095
100.	0.20	143.2	22.59	52.66	77.69	0.3088	0.3129	-6.88	-3.91	-0.1255	0.9668	0.0061	-0.0003	6.5832	5.036
100.	0.50	153.1	17.22	57.48	80.47	0.3023	0.3108	-2.06	-1.14	-0.0388	1.0150	-0.0005	-0.0024	1.8081	1.592
100.	0.80	172.9	6.53	58.91	81.26	0.3022	0.3122	-0.64	-0.35	-0.0120	1.0092	-0.0006	-0.0010	0.7134	0.561
120.	0.00	183.1	1.01	43.50	71.92	0.3432	0.3438	-16.04	-9.69	-0.2799	0.5956	0.0405	0.0306	30.2657	20.041
120.	0.02	175.0	5.43	44.78	72.77	0.3358	0.3364	-14.75	-8.83	-0.2589	0.6736	0.0331	0.0232	25.3945	16.761
120.	0.05	164.2	11.23	46.51	73.90	0.3274	0.3284	-13.02	-7.70	-0.2302	0.7654	0.0247	0.0151	19.6856	13.069
120.	0.10	149.5	19.19	48.95	75.44	0.3180	0.3200	-10.59	-6.16	-0.1893	0.8695	0.0153	0.0067	13.1610	9.038
120.	0.20	140.9	23.02	52.51	77.61	0.3085	0.3126	-7.03	-4.00	-0.1280	0.9703	0.0057	-0.0006	6.4758	5.048
120.	0.50	153.2	17.19	57.43	80.44	0.3022	0.3107	-2.11	-1.17	-0.0396	1.0171	-0.0006	-0.0023	1.8457	1.623
120.	0.80	172.9	6.53	58.89	81.23	0.3021	0.3122	-0.66	-0.36	-0.0122	1.0102	-0.0007	-0.0010	0.7306	0.576
140.	0.00	173.1	5.36	43.34	71.81	0.3427	0.3433	-16.19	-9.79	-0.2823	0.5988	0.0400	0.0303	30.0171	19.929
140.	0.02	165.4	10.59	44.64	72.68	0.3353	0.3361	-14.90	-8.93	-0.2612	0.6770	0.0326	0.0229	25.1645	16.665
140.	0.05	152.7	17.46	46.39	73.82	0.3270	0.3281	-13.15	-7.79	-0.2323	0.7690	0.0242	0.0149	19.4835	12.934
140.	0.10	145.2	21.52	48.84	75.37	0.3177	0.3197	-10.70	-6.23	-0.1910	0.8731	0.0150	0.0065	13.0029	8.993
140.	0.20	141.1	23.72	52.44	77.56	0.3083	0.3125	-7.11	-4.04	-0.1292	0.9740	0.0053	-0.0007	6.3947	5.033
140.	0.50	153.2	17.17	57.41	80.43	0.3021	0.3107	-2.14	-1.18	-0.0400	1.0186	-0.0007	-0.0025	1.8628	1.633
140.	0.80	172.9	6.53	58.88	81.24	0.3021	0.3121	-0.67	-0.37	-0.0124	1.0109	-0.0007	-0.0011	0.7328	0.583
160.	0.00	162.0	12.46	43.27	71.76	0.3424	0.3433	-16.27	-9.84	-0.2836	0.6013	0.0397	0.0301	29.8659	19.764
160.	0.02	156.4	15.48	44.57	72.63	0.3351	0.3360	-14.97	-8.98	-0.2623	0.6796	0.0323	0.0228	25.0237	16.698

Exhibit A-8 (continued)

160.	0.05	151.3	18.20	46.32	73.78	0.3268	0.3280	-13.22	-7.83	-0.2332	0.7718	0.0240	0.0148	19.6589	12.[illegible]
160.	0.10	145.3	21.44	48.79	75.34	0.3173	0.3196	-10.76	-6.27	-0.1918	0.8759	0.0143	0.0064	12.9021	8.561
160.	0.20	141.2	23.67	52.40	77.54	0.3081	0.3124	-7.15	-4.07	-0.1297	0.9764	0.0054	-0.0008	6.3856	5.[illegible]
160.	0.50	153.3	17.16	57.39	80.42	0.3020	0.3107	-2.16	-1.19	-0.0401	1.0193	-0.0008	-0.0025	1.8709	1.[illegible]
160.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.67	-0.37	-0.0124	1.0115	-0.0007	-0.0011	0.7668	0.[illegible]
180.	0.00	161.1	12.94	43.23	71.73	0.3423	0.3433	-16.32	-9.87	-0.2340	0.6032	0.0395	0.0301	29.7767	19.[illegible]
180.	0.02	156.5	15.42	44.53	72.61	0.3349	0.3360	-15.01	-9.00	-0.2627	0.6817	0.0322	0.0227	24.9402	16.[illegible]
180.	0.05	151.4	18.15	46.29	73.75	0.3265	0.3279	-13.26	-7.85	-0.2336	0.7739	0.0238	0.0147	19.2329	12.[illegible]
180.	0.10	145.4	21.40	48.76	75.32	0.3174	0.3196	-10.79	-6.28	-0.1921	0.8789	0.0146	0.0064	12.8403	8.841
180.	0.20	141.2	23.65	52.38	77.53	0.3081	0.3124	-7.17	-4.08	-0.1299	0.9782	0.0053	-0.0008	6.3918	5.[illegible]
180.	0.50	153.3	17.16	57.39	80.41	0.3020	0.3107	-2.16	-1.20	-0.0402	1.0208	-0.0008	-0.0025	1.8728	1.[illegible]
180.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0119	-0.0007	-0.0011	0.7653	0.[illegible]
200.	0.00	161.1	12.92	43.21	71.72	0.3422	0.3433	-16.34	-9.89	-0.2342	0.6046	0.0394	0.0301	29.7261	19.[illegible]
200.	0.02	156.5	15.40	44.51	72.59	0.3348	0.3359	-15.03	-9.01	-0.2629	0.6832	0.0321	0.0227	24.8925	16.[illegible]
200.	0.05	151.4	18.14	46.27	73.74	0.3265	0.3279	-13.27	-7.86	-0.2337	0.7756	0.0237	0.0147	19.2304	12.[illegible]
200.	0.10	145.4	21.39	48.75	75.31	0.3173	0.3196	-10.80	-6.29	-0.1922	0.8797	0.0145	0.0064	12.8939	8.[illegible]
200.	0.20	141.3	23.65	52.37	77.52	0.3080	0.3124	-7.18	-4.09	-0.1309	0.9797	0.0052	-0.0008	6.2788	5.[illegible]
200.	0.50	153.3	17.16	57.38	80.41	0.3020	0.3107	-2.17	-1.20	-0.0402	1.0215	-0.0008	-0.0025	1.8735	1.[illegible]
200.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0123	-0.0007	-0.0011	0.7677	0.[illegible]
220.	0.00	161.1	12.91	43.20	71.72	0.3421	0.3433	-16.35	-9.89	-0.2342	0.6057	0.0393	0.0300	29.6992	19.[illegible]
220.	0.02	156.5	15.39	44.51	72.59	0.3348	0.3359	-15.04	-9.02	-0.2628	0.6843	0.0320	0.0227	24.8669	16.[illegible]
220.	0.05	151.5	18.13	46.26	73.74	0.3265	0.3279	-13.28	-7.87	-0.2337	0.7768	0.0237	0.0147	19.2160	12.[illegible]
220.	0.10	145.4	21.39	48.74	75.31	0.3173	0.3196	-10.81	-6.30	-0.1922	0.8809	0.0145	0.0064	12.7833	8.[illegible]
220.	0.20	141.3	23.65	52.36	77.52	0.3080	0.3124	-7.18	-4.09	-0.1309	0.9807	0.0052	-0.0008	6.2655	5.[illegible]
220.	0.50	153.3	17.16	57.38	80.41	0.3020	0.3107	-2.17	-1.20	-0.0402	1.0220	-0.0008	-0.0025	1.8736	1.[illegible]
220.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0125	-0.0007	-0.0011	0.7689	0.[illegible]
230.	0.00	161.1	12.91	43.20	71.71	0.3421	0.3433	-16.35	-9.89	-0.2342	0.6060	0.0393	0.0300	29.6928	19.[illegible]
230.	0.02	156.5	15.39	44.50	72.59	0.3348	0.3359	-15.04	-9.02	-0.2628	0.6847	0.0320	0.0227	24.8608	16.[illegible]
230.	0.05	151.5	18.13	46.26	73.74	0.3265	0.3279	-13.28	-7.87	-0.2337	0.7772	0.0237	0.0147	19.2103	12.[illegible]
230.	0.10	145.4	21.39	48.74	75.31	0.3173	0.3196	-10.81	-6.30	-0.1922	0.8813	0.0145	0.0064	12.7787	8.[illegible]
230.	0.20	141.3	23.65	52.36	77.52	0.3080	0.3124	-7.18	-4.09	-0.1309	0.9810	0.0052	-0.0008	6.2622	5.[illegible]
230.	0.50	153.3	17.16	57.38	80.41	0.3020	0.3107	-2.17	-1.20	-0.0402	1.0221	-0.0008	-0.0025	1.8733	1.[illegible]
230.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0126	-0.0007	-0.0011	0.7692	0.[illegible]
235.	0.00	161.1	12.91	43.20	71.71	0.3421	0.3433	-16.35	-9.89	-0.2342	0.6062	0.0393	0.0300	29.6911	19.[illegible]
235.	0.02	156.5	15.39	44.50	72.59	0.3348	0.3359	-15.04	-9.02	-0.2628	0.6849	0.0320	0.0227	24.8591	16.[illegible]
235.	0.05	151.5	18.13	46.26	73.74	0.3265	0.3279	-13.28	-7.87	-0.2337	0.7773	0.0237	0.0147	19.2087	12.[illegible]
235.	0.10	145.4	21.39	48.74	75.31	0.3173	0.3196	-10.81	-6.30	-0.1922	0.8814	0.0145	0.0064	12.7774	8.[illegible]
235.	0.20	141.3	23.65	52.36	77.52	0.3080	0.3124	-7.18	-4.09	-0.1309	0.9812	0.0052	-0.0008	6.2611	5.[illegible]
235.	0.50	153.3	17.16	57.38	80.41	0.3020	0.3107	-2.17	-1.20	-0.0402	1.0222	-0.0008	-0.0025	1.8733	1.641
235.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0126	-0.0008	-0.0011	0.7692	0.599
238.	0.00	161.1	12.91	43.20	71.71	0.3421	0.3433	-16.35	-9.89	-0.2342	0.6062	0.0393	0.0300	29.6905	19.[illegible]
238.	0.02	156.5	15.39	44.50	72.59	0.3348	0.3359	-15.04	-9.02	-0.2628	0.6849	0.0320	0.0227	24.8585	16.[illegible]
238.	0.05	151.5	18.13	46.26	73.74	0.3265	0.3279	-13.28	-7.87	-0.2337	0.7774	0.0237	0.0147	19.2082	12.891
238.	0.10	145.4	21.39	48.74	75.31	0.3173	0.3196	-10.81	-6.30	-0.1922	0.8815	0.0145	0.0064	12.7768	8.917
238.	0.20	141.3	23.65	52.36	77.52	0.3080	0.3124	-7.18	-4.09	-0.1309	0.9812	0.0052	-0.0008	6.2608	5.[illegible]
238.	0.50	153.3	17.16	57.38	80.41	0.3020	0.3107	-2.17	-1.20	-0.0402	1.0222	-0.0008	-0.0025	1.8733	1.641
238.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0126	-0.0008	-0.0011	0.7693	0.599
239.	0.00	161.1	12.91	43.20	71.71	0.3421	0.3433	-16.35	-9.89	-0.2342	0.6062	0.0393	0.0300	29.6903	19.[illegible]
239.	0.02	156.5	15.39	44.50	72.59	0.3348	0.3359	-15.04	-9.02	-0.2628	0.6850	0.0320	0.0227	24.8584	16.[illegible]
239.	0.05	151.5	18.13	46.26	73.74	0.3265	0.3279	-13.28	-7.87	-0.2337	0.7774	0.0237	0.0147	19.2080	12.891
239.	0.10	145.4	21.39	48.74	75.31	0.3173	0.3196	-10.81	-6.30	-0.1922	0.8815	0.0145	0.0064	12.7767	8.917
239.	0.20	141.3	23.65	52.36	77.52	0.3080	0.3124	-7.18	-4.09	-0.1309	0.9812	0.0052	-0.0008	6.2607	5.[illegible]
239.	0.50	153.3	17.16	57.38	80.41	0.3020	0.3107	-2.17	-1.20	-0.0402	1.0222	-0.0008	-0.0025	1.8733	1.641
239.	0.80	172.9	6.53	58.87	81.24	0.3021	0.3121	-0.68	-0.37	-0.0124	1.0126	-0.0008	-0.0011	0.7693	0.599

Exhibit A-8 (continued)

VISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME
1600 MW POWER PLANT
DOWNWIND DISTANCE (KM) = 240.0

THETA	LENGTH	RP/RV0	RV	%REDUCED	YCAP	L	X	Y	DELYCAP	DELL	C(550)	BRATIO	DELX	DELY	E(LUV)	E(LAB)
135.																
	20.	0.00	181.3	1.99	55.65	79.43	0.3267	0.3419	-8.25	-4.49	-0.1217	0.6420	0.0285	0.0311	25.1666	16.426
	20.	0.02	180.8	2.25	56.32	79.81	0.3224	0.3363	-7.56	-4.11	-0.1126	0.7047	0.0242	0.0256	21.4465	13.853
	20.	0.05	180.2	2.61	57.21	80.32	0.3172	0.3298	-6.65	-3.59	-0.1002	0.7794	0.0190	0.0191	16.9239	10.799
	20.	0.10	179.3	3.11	58.47	81.02	0.3111	0.3223	-5.37	-2.88	-0.0824	0.8656	0.0129	0.0116	11.4806	7.235
	20.	0.20	177.9	3.84	60.28	82.01	0.3043	0.3146	-3.51	-1.87	-0.0558	0.9529	0.0060	0.0040	5.3958	3.428
	20.	0.50	176.0	4.86	62.72	83.31	0.2988	0.3100	-1.02	-0.53	-0.0173	1.0026	0.0004	-0.0005	0.8307	0.701
	20.	0.80	175.4	5.17	63.42	83.68	0.2983	0.3101	-0.31	-0.16	-0.0053	1.0029	-0.0001	-0.0004	0.2849	0.242
	40.	0.00	184.1	0.49	50.85	76.61	0.3378	0.3480	-12.98	-7.28	-0.1997	0.5049	0.0393	0.0373	32.0957	20.964
	40.	0.02	182.3	1.44	51.90	77.24	0.3312	0.3404	-11.92	-6.65	-0.1847	0.6601	0.0329	0.0297	27.1137	17.506
	40.	0.05	180.0	2.70	53.32	78.08	0.3235	0.3318	-10.49	-5.80	-0.1643	0.7492	0.0252	0.0212	21.1702	13.524
	40.	0.10	176.8	4.45	55.30	79.23	0.3148	0.3225	-8.50	-4.64	-0.1351	0.8514	0.0165	0.0118	14.1926	9.049
	40.	0.20	172.1	6.97	58.18	80.85	0.3055	0.3135	-5.59	-3.01	-0.0914	0.9536	0.0072	0.0029	6.6765	4.498
	40.	0.50	165.7	10.41	62.09	82.98	0.2985	0.3091	-1.64	-0.86	-0.0283	1.0078	0.0002	-0.0014	1.3267	1.170
	40.	0.80	172.8	6.60	63.22	83.57	0.2981	0.3098	-0.50	-0.26	-0.0088	1.0057	-0.0003	-0.0007	0.4990	0.409
	60.	0.00	188.2	-1.73	48.15	74.94	0.3399	0.3460	-15.64	-8.93	-0.2467	0.5851	0.0416	0.0353	32.8804	21.466
	60.	0.02	184.8	0.13	49.41	75.73	0.3326	0.3381	-14.37	-8.14	-0.2281	0.6629	0.0343	0.0275	27.6454	17.898
	60.	0.05	180.2	2.60	51.11	76.76	0.3242	0.3293	-12.67	-7.10	-0.2029	0.7547	0.0259	0.0188	21.4686	13.851
	60.	0.10	173.9	5.98	53.49	78.18	0.3148	0.3201	-10.28	-5.68	-0.1669	0.8594	0.0165	0.0095	14.3291	9.390
	60.	0.20	165.0	10.80	56.96	80.17	0.3050	0.3116	-6.79	-3.68	-0.1129	0.9625	0.0067	0.0011	6.8420	4.948
	60.	0.50	153.1	17.26	61.71	82.77	0.2982	0.3085	-2.02	-1.06	-0.0349	1.0130	-0.0002	-0.0020	1.6532	1.464
	60.	0.80	172.9	6.56	63.10	83.51	0.2979	0.3093	-0.62	-0.33	-0.0108	1.0082	-0.0005	-0.0009	0.6466	0.515
	80.	0.00	190.7	-3.07	46.75	74.05	0.3393	0.3434	-17.01	-9.81	-0.2717	0.5927	0.0410	0.0328	32.2717	21.153
	80.	0.02	185.4	-0.24	48.11	74.92	0.3318	0.3356	-15.63	-8.94	-0.2513	0.6713	0.0335	0.0251	27.0559	17.652
	80.	0.05	178.5	3.49	49.95	76.06	0.3233	0.3271	-13.80	-7.79	-0.2235	0.7639	0.0250	0.0166	20.9410	13.709
	80.	0.10	169.1	8.58	52.53	77.62	0.3139	0.3182	-11.21	-6.23	-0.1838	0.8688	0.0155	0.0077	13.9431	9.402
	80.	0.20	155.8	15.78	56.31	79.81	0.3043	0.3104	-7.43	-4.04	-0.1243	0.9709	0.0059	-0.0001	6.7486	5.147
	80.	0.50	153.1	17.24	61.50	82.66	0.2978	0.3081	-2.22	-1.17	-0.0385	1.0173	-0.0006	-0.0024	1.8404	1.620
	80.	0.80	172.9	6.54	63.03	83.47	0.2977	0.3094	-0.69	-0.36	-0.0119	1.0103	-0.0006	-0.0010	0.7371	0.574
	100.	0.00	190.5	-2.97	46.05	73.60	0.3383	0.3419	-17.70	-10.25	-0.2840	0.5994	0.0399	0.0313	31.6383	20.848
	100.	0.02	183.5	0.79	47.46	74.51	0.3308	0.3342	-16.28	-9.34	-0.2626	0.6785	0.0325	0.0237	26.4729	17.408
	100.	0.05	174.4	5.73	49.37	75.70	0.3224	0.3259	-14.37	-8.14	-0.2335	0.7715	0.0240	0.0154	20.4392	13.547
	100.	0.10	161.9	12.46	52.05	77.33	0.3131	0.3172	-11.69	-6.51	-0.1921	0.8763	0.0147	0.0067	13.5764	9.349
	100.	0.20	144.4	21.93	55.97	79.62	0.3037	0.3098	-7.76	-4.22	-0.1299	0.9776	0.0053	-0.0007	6.6172	5.218
	100.	0.50	153.3	17.16	61.39	82.60	0.2976	0.3079	-2.33	-1.23	-0.0402	1.0206	-0.0008	-0.0026	1.9369	1.695
	100.	0.80	172.9	6.53	62.99	83.45	0.2976	0.3094	-0.73	-0.38	-0.0124	1.0119	-0.0007	-0.0011	0.7890	0.605
	120.	0.00	187.0	-1.09	45.69	73.37	0.3375	0.3411	-18.04	-10.47	-0.2897	0.6046	0.0391	0.0306	31.1943	20.647
	120.	0.02	178.4	3.54	47.13	74.30	0.3301	0.3335	-16.60	-9.55	-0.2679	0.6841	0.0317	0.0230	26.0651	17.243
	120.	0.05	167.2	9.63	49.07	75.52	0.3217	0.3253	-14.66	-8.32	-0.2383	0.7774	0.0233	0.0148	20.0862	13.428
	120.	0.10	151.8	17.93	51.80	77.18	0.3125	0.3167	-11.93	-6.66	-0.1960	0.8824	0.0141	0.0062	13.3115	9.291
	120.	0.20	141.7	23.42	55.80	79.52	0.3033	0.3094	-7.92	-4.32	-0.1325	0.9827	0.0049	-0.0011	6.5039	5.234
	120.	0.50	153.3	17.12	61.33	82.57	0.2974	0.3078	-2.39	-1.26	-0.0410	1.0232	-0.0010	-0.0027	1.9852	1.722
	120.	0.80	172.9	6.52	62.97	83.44	0.2976	0.3093	-0.75	-0.39	-0.0127	1.0131	-0.0008	-0.0011	0.8188	0.622
	140.	0.00	179.6	2.90	45.51	73.25	0.3369	0.3408	-18.22	-10.59	-0.2923	0.6086	0.0385	0.0303	30.9146	20.527
	140.	0.02	169.5	8.37	46.96	74.19	0.3295	0.3332	-16.77	-9.65	-0.2703	0.6884	0.0312	0.0227	25.8071	17.141
	140.	0.05	156.2	15.57	48.92	75.42	0.3212	0.3250	-14.81	-8.41	-0.2404	0.7819	0.0229	0.0145	19.8604	13.350
	140.	0.10	146.6	20.74	51.68	77.11	0.3121	0.3165	-12.05	-6.73	-0.1977	0.8869	0.0137	0.0060	13.1368	9.246
	140.	0.20	141.9	23.32	55.71	79.47	0.3030	0.3093	-8.01	-4.37	-0.1337	0.9866	0.0046	-0.0012	6.4195	5.229
	140.	0.50	153.4	17.10	61.30	82.56	0.2973	0.3078	-2.42	-1.28	-0.0414	1.0251	-0.0011	-0.0027	2.0009	1.744
	140.	0.80	172.9	6.52	62.96	83.44	0.2976	0.3093	-0.76	-0.40	-0.0128	1.0140	-0.0008	-0.0011	0.8258	0.631

Exhibit A-8 (continued)

160.	0.00	167.2	9.63	45.42	73.19	0.3366	0.3406	-18.31	-10.65	-0.2934	0.6116	0.0382	0.0301	30.7470	20.459
160.	0.02	159.0	14.08	46.80	74.13	0.3292	0.3330	-16.85	-9.70	-0.2713	0.6917	0.0308	0.0226	25.6512	17.081
160.	0.05	153.3	17.14	48.84	75.38	0.3210	0.3248	-14.88	-8.46	-0.2413	0.7854	0.0226	0.0144	19.7223	13.302
160.	0.10	146.8	20.66	51.61	77.07	0.3119	0.3164	-12.11	-6.77	-0.1984	0.8903	0.0135	0.0059	13.0269	9.214
160.	0.20	141.9	23.27	55.67	79.44	0.3028	0.3092	-8.06	-4.39	-0.1342	0.9895	0.0044	-0.0013	6.3613	5.219
160.	0.50	153.4	17.10	61.28	82.55	0.2973	0.3077	-2.44	-1.29	-0.0415	1.0265	-0.0011	-0.0027	2.0200	1.751
160.	0.80	172.9	6.52	62.93	83.43	0.2975	0.3093	-0.77	-0.40	-0.0128	1.0147	-0.0009	-0.0011	0.8455	0.635
180.	0.00	163.7	11.53	45.37	73.16	0.3364	0.3405	-18.35	-10.68	-0.2939	0.6140	0.0380	0.0301	30.6497	20.420
180.	0.02	159.1	14.01	46.83	74.10	0.3290	0.3330	-16.89	-9.73	-0.2717	0.6941	0.0306	0.0225	25.5603	17.047
180.	0.05	153.4	17.09	48.80	75.35	0.3208	0.3248	-14.92	-8.49	-0.2417	0.7880	0.0224	0.0143	19.6407	13.273
180.	0.10	146.8	20.62	51.58	77.05	0.3117	0.3163	-12.14	-6.79	-0.1987	0.8929	0.0134	0.0059	12.9606	9.193
180.	0.20	142.0	23.26	55.64	79.43	0.3027	0.3092	-8.08	-4.41	-0.1344	0.9917	0.0044	-0.0013	6.3236	5.210
180.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.29	-0.0416	1.0276	-0.0011	-0.0027	2.0249	1.753
180.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0152	-0.0009	-0.0011	0.8508	0.637
200.	0.00	163.7	11.51	45.35	73.14	0.3362	0.3405	-18.38	-10.69	-0.2940	0.6157	0.0379	0.0301	30.5953	20.400
200.	0.02	159.1	13.99	46.81	74.09	0.3289	0.3330	-16.91	-9.74	-0.2719	0.6960	0.0305	0.0225	25.5091	17.028
200.	0.05	153.4	17.08	48.78	75.34	0.3207	0.3248	-14.94	-8.50	-0.2418	0.7899	0.0223	0.0143	19.5943	13.256
200.	0.10	146.9	20.61	51.56	77.04	0.3117	0.3163	-12.16	-6.80	-0.1988	0.8948	0.0133	0.0059	12.9219	9.180
200.	0.20	142.0	23.25	55.63	79.42	0.3027	0.3092	-8.09	-4.41	-0.1344	0.9934	0.0043	-0.0013	6.3003	5.203
200.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.30	-0.0416	1.0284	-0.0012	-0.0027	2.0268	1.753
200.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0156	-0.0009	-0.0011	0.8537	0.639
220.	0.00	163.7	11.51	45.34	73.14	0.3362	0.3405	-18.38	-10.70	-0.2940	0.6169	0.0378	0.0300	30.5674	20.389
220.	0.02	159.1	13.99	46.80	74.08	0.3289	0.3330	-16.92	-9.75	-0.2719	0.6973	0.0305	0.0225	25.4826	17.018
220.	0.05	153.4	17.08	48.77	75.33	0.3206	0.3247	-14.95	-8.50	-0.2418	0.7913	0.0222	0.0143	19.5699	13.247
220.	0.10	146.9	20.61	51.55	77.03	0.3116	0.3163	-12.17	-6.80	-0.1988	0.8962	0.0132	0.0059	12.9012	9.172
220.	0.20	142.0	23.25	55.62	79.42	0.3027	0.3091	-8.09	-4.42	-0.1345	0.9946	0.0043	-0.0013	6.2871	5.198
220.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.30	-0.0416	1.0290	-0.0012	-0.0027	2.0274	1.753
220.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0159	-0.0009	-0.0011	0.8552	0.639
230.	0.00	163.7	11.51	45.33	73.13	0.3362	0.3405	-18.39	-10.70	-0.2940	0.6173	0.0378	0.0300	30.5613	20.387
230.	0.02	159.1	13.99	46.80	74.08	0.3288	0.3330	-16.92	-9.75	-0.2719	0.6978	0.0305	0.0225	25.4768	17.016
230.	0.05	153.4	17.08	48.77	75.33	0.3206	0.3247	-14.95	-8.50	-0.2418	0.7918	0.0222	0.0143	19.5645	13.245
230.	0.10	146.9	20.61	51.55	77.03	0.3116	0.3163	-12.17	-6.80	-0.1988	0.8967	0.0132	0.0059	12.8965	9.170
230.	0.20	142.0	23.25	55.62	79.42	0.3026	0.3091	-8.10	-4.42	-0.1345	0.9950	0.0043	-0.0013	6.2838	5.197
230.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.30	-0.0416	1.0292	-0.0012	-0.0027	2.0273	1.753
230.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0160	-0.0009	-0.0011	0.8554	0.639
235.	0.00	163.7	11.51	45.33	73.13	0.3362	0.3405	-18.39	-10.70	-0.2940	0.6175	0.0378	0.0301	30.5599	20.387
235.	0.02	159.1	13.99	46.80	74.08	0.3288	0.3330	-16.92	-9.75	-0.2719	0.6979	0.0305	0.0225	25.4756	17.016
235.	0.05	153.4	17.08	48.77	75.33	0.3206	0.3247	-14.95	-8.50	-0.2418	0.7919	0.0222	0.0143	19.5633	13.245
235.	0.10	146.9	20.61	51.55	77.03	0.3116	0.3163	-12.17	-6.80	-0.1988	0.8968	0.0132	0.0059	12.8954	9.170
235.	0.20	142.0	23.25	55.62	79.42	0.3026	0.3091	-8.10	-4.42	-0.1345	0.9951	0.0043	-0.0013	6.2830	5.197
235.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.30	-0.0416	1.0293	-0.0012	-0.0027	2.0273	1.753
235.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0160	-0.0009	-0.0011	0.8555	0.639
238.	0.00	163.7	11.51	45.33	73.13	0.3362	0.3405	-18.39	-10.70	-0.2940	0.6175	0.0378	0.0301	30.5597	20.387
238.	0.02	159.1	13.99	46.80	74.08	0.3288	0.3330	-16.92	-9.75	-0.2719	0.6980	0.0305	0.0225	25.4752	17.016
238.	0.05	153.4	17.08	48.77	75.33	0.3206	0.3247	-14.95	-8.50	-0.2418	0.7920	0.0222	0.0143	19.5631	13.245
238.	0.10	146.9	20.61	51.55	77.03	0.3116	0.3163	-12.17	-6.80	-0.1988	0.8969	0.0132	0.0059	12.8952	9.170
238.	0.20	142.0	23.25	55.62	79.42	0.3026	0.3091	-8.10	-4.42	-0.1345	0.9952	0.0043	-0.0013	6.2828	5.196
238.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.30	-0.0416	1.0293	-0.0012	-0.0027	2.0273	1.753
238.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0160	-0.0009	-0.0011	0.8556	0.639
239.	0.00	163.7	11.51	45.33	73.13	0.3362	0.3405	-18.39	-10.70	-0.2940	0.6175	0.0378	0.0301	30.5597	20.387
239.	0.02	159.1	13.99	46.80	74.08	0.3288	0.3330	-16.92	-9.75	-0.2719	0.6980	0.0305	0.0225	25.4752	17.016
239.	0.05	153.4	17.08	48.77	75.33	0.3206	0.3247	-14.95	-8.50	-0.2418	0.7920	0.0222	0.0143	19.5631	13.245
239.	0.10	146.9	20.61	51.55	77.03	0.3116	0.3163	-12.17	-6.80	-0.1988	0.8969	0.0132	0.0059	12.8951	9.170
239.	0.20	142.0	23.25	55.62	79.42	0.3026	0.3091	-8.10	-4.42	-0.1345	0.9952	0.0043	-0.0013	6.2827	5.196
239.	0.50	153.4	17.09	61.27	82.54	0.2972	0.3077	-2.45	-1.30	-0.0416	1.0293	-0.0012	-0.0027	2.0273	1.753
239.	0.80	172.9	6.52	62.95	83.43	0.2975	0.3093	-0.77	-0.40	-0.0129	1.0160	-0.0009	-0.0011	0.8556	0.639

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 1.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	906	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 2.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	851	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	900	0.00	0.00	0.00	0.00	0.00	1.66	0.00	0.00	0.00	0.00	0.00	11.64

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 5.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	826	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	833	0.00	0.00	0.00	0.00	0.00	1.55	0.00	0.00	0.00	0.00	0.00	10.83
0.7	900	0.00	0.00	0.00	0.00	0.00	1.66	0.00	0.00	0.00	0.00	0.00	11.64

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 10.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0
0.1	745	0.00	0.00	0.00	0.00	0.00	0.00
0.3	753	0.00	0.00	0.00	0.00	0.00	1.20
0.7	818	0.00	0.00	0.00	0.00	0.00	1.32
1.4	900	0.00	0.00	0.00	0.00	0.00	1.66

NOX-TO-HNO3 CONVERSION RATE (%/HR)

H+2S	H+1S	H	H-1S	H-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	8.40
0.00	0.00	0.00	0.00	0.00	9.21
0.00	0.00	0.00	0.00	0.00	11.64

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 20.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0
0.1	622	0.00	0.00	0.00	0.00	0.00	0.00
0.3	630	0.00	0.00	0.00	0.00	0.00	0.68
0.7	655	0.00	0.00	0.00	0.00	0.00	0.76
1.4	737	0.00	0.00	0.00	0.00	0.00	1.08
2.8	900	0.00	0.00	0.00	0.00	0.00	1.66

NOX-TO-HNO3 CONVERSION RATE (%/HR)

H+2S	H+1S	H	H-1S	H-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	4.78
0.00	0.00	0.00	0.00	0.00	5.34
0.00	0.00	0.00	0.00	0.00	7.59
0.01	0.00	0.00	0.00	0.01	11.64

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 40.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0
0.1	336	0.00	0.00	0.00	0.00	0.00	0.00
0.3	345	0.00	0.00	0.00	0.00	0.00	0.10
0.7	410	0.00	0.00	0.00	0.00	0.00	0.13
1.4	451	0.00	0.00	0.00	0.00	0.00	0.23
2.8	614	0.00	0.00	0.00	0.00	0.00	0.60
5.5	900	0.00	0.00	0.00	0.00	0.00	0.51

NOX-TO-HNO3 CONVERSION RATE (%/HR)

H+2S	H+1S	H	H-1S	H-2S	0
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.72
0.00	0.00	0.00	0.00	0.00	0.94
0.00	0.00	0.00	0.00	0.00	1.60
0.00	0.00	0.00	0.00	0.00	4.22
0.03	0.01	0.00	0.01	0.03	3.60

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 60.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0	NOX-TO-HNO3 CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0
0.1	51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.7	124	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.4	205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.8	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	614	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.11
8.3	900	0.02	0.00	0.00	0.00	0.01	0.08	0.11	0.02	0.01	0.02	0.10	0.54

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 80.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0	NOX-TO-HNO3 CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0
0.1	2203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	2213	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.7	2238	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.4	2320	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.8	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.3	614	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
11.0	900	0.03	0.00	0.00	0.00	0.02	0.04	0.21	0.03	0.02	0.03	0.17	0.28

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 100.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0	NOX-TO-HNO3 CONVERSION RATE (%/HR) H+2S	H+1S	H	H-1S	H-2S	0
0.1	1919	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	1928	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.7	1952	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.4	2034	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.8	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.3	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	614	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
13.8	900	0.05	0.01	0.00	0.01	0.03	0.03	0.32	0.04	0.02	0.04	0.21	0.23

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 120.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	1634	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	1642	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.7	1707	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.4	1748	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.8	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.3	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.8	614	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
16.6	900	0.06	0.01	0.00	0.01	0.03	0.03	0.43	0.06	0.03	0.06	0.22	0.22

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 140.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	1348	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	1356	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.73
0.7	1421	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.52
1.4	1502	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.08
2.8	1625	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
5.5	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.3	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.8	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.6	614	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
19.3	900	0.08	0.01	0.01	0.01	0.03	0.03	0.54	0.08	0.04	0.08	0.23	0.22

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 160.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	1102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	1110	0.00	0.00	0.00	0.00	0.00	1.78	0.00	0.00	0.00	0.00	0.00	12.45
0.7	1135	0.00	0.00	0.00	0.00	0.00	1.66	0.00	0.00	0.00	0.00	0.00	11.65
1.4	1217	0.00	0.00	0.00	0.00	0.00	1.32	0.00	0.00	0.00	0.00	0.00	9.23
2.8	1340	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	5.31
5.5	1625	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.19
8.3	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.8	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.6	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.3	614	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00
22.1	900	0.09	0.01	0.01	0.01	0.03	0.03	0.65	0.10	0.05	0.10	0.23	0.22

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 180.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	816	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	825	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	20.98
0.7	850	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	20.97
1.4	931	0.00	0.00	0.00	0.00	0.00	2.99	0.01	0.00	0.00	0.00	0.01	20.92
2.8	1054	0.00	0.00	0.00	0.00	0.00	2.83	0.02	0.00	0.00	0.00	0.02	19.72
5.5	1340	0.01	0.00	0.00	0.00	0.01	0.58	0.04	0.01	0.00	0.01	0.04	4.08
8.3	1625	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
11.0	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.8	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.6	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.3	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.1	614	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01
24.9	900	0.11	0.02	0.01	0.02	0.03	0.04	0.76	0.12	0.07	0.11	0.24	0.30

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 200.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	531	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	539	0.00	0.00	0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00	0.00	7.42
0.7	604	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00	8.23
1.4	645	0.00	0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.00	0.00	0.00	10.66
2.8	808	0.00	0.00	0.00	0.00	0.00	2.10	0.01	0.00	0.00	0.00	0.01	14.67
5.5	1054	0.01	0.00	0.00	0.00	0.01	1.23	0.06	0.01	0.01	0.01	0.06	8.64
8.3	1340	0.02	0.00	0.00	0.00	0.02	0.14	0.12	0.02	0.01	0.02	0.12	1.00
11.0	1625	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.03
13.8	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.6	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.3	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.1	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.9	614	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01
27.6	900	0.12	0.02	0.01	0.02	0.04	0.07	0.86	0.14	0.08	0.13	0.25	0.49

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 220.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	253	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.06
0.7	318	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.08
1.4	400	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.23
2.8	522	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	1.33
5.5	808	0.00	0.00	0.00	0.00	0.00	0.31	0.02	0.00	0.00	0.00	0.02	2.14
8.3	1054	0.03	0.00	0.00	0.00	0.03	0.21	0.20	0.03	0.02	0.03	0.20	1.45
11.0	1340	0.03	0.00	0.00	0.00	0.03	0.08	0.24	0.03	0.02	0.03	0.20	0.57
13.8	1625	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.02
16.6	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.3	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.1	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.9	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27.6	614	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.01
30.4	900	0.15	0.03	0.02	0.02	0.03	0.05	1.03	0.20	0.11	0.16	0.20	0.36

Exhibit A-8 (continued)

HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE = 240.0 KM

PARCEL AGE (HR)	LOCAL TIME	SO2-TO-SO4= CONVERSION RATE (%/HR)						NOX-TO-HNO3 CONVERSION RATE (%/HR)					
		H+2S	H+1S	H	H-1S	H-2S	0	H+2S	H+1S	H	H-1S	H-2S	0
0.1	2359	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.7	32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.4	114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.8	237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	522	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
8.3	808	0.01	0.00	0.00	0.00	0.01	0.04	0.05	0.01	0.00	0.01	0.05	0.27
11.0	1054	0.06	0.01	0.00	0.01	0.05	0.08	0.39	0.05	0.03	0.05	0.33	0.57
13.8	1340	0.05	0.01	0.00	0.01	0.03	0.04	0.36	0.05	0.03	0.05	0.24	0.30
16.6	1625	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.01
19.3	1911	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.1	2157	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.9	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27.6	328	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.4	614	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
33.1	900	0.11	0.04	0.02	0.03	0.02	0.03	0.78	0.28	0.15	0.18	0.17	0.19

Exhibit A-8 (continued)

PLOT FILE VERIFICATION

PLUME-BASED DATA

SKY BACKGROUND

NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	11.973	9.556	6.737	5.153	4.127	3.519	3.288	3.166	3.086	3.027	2.979	2.940	2.908	2.570	2.213	1.96
BLUE-RED RATIO	0.921	0.857	0.827	0.825	0.819	0.808	0.801	0.796	0.793	0.791	0.790	0.789	0.789	0.801	0.818	0.83
PLUME CONTRAST AT 0.55 MICRONS	-0.094	-0.108	-0.106	-0.098	-0.094	-0.095	-0.097	-0.099	-0.100	-0.101	-0.101	-0.101	-0.101	-0.092	-0.081	-0.07
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	4.864	7.459	8.674	8.601	8.758	9.270	9.619	9.862	10.024	10.125	10.184	10.214	10.223	9.523	8.617	7.91

WHITE BACKGROUND

NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	1.101	0.985	0.909	0.886	0.866	0.844	0.833	0.826	0.821	0.818	0.816	0.815	0.814	0.824	0.837	0.84
PLUME CONTRAST AT 0.55 MICRONS	-0.169	-0.169	-0.152	-0.135	-0.124	-0.121	-0.121	-0.122	-0.123	-0.123	-0.123	-0.123	-0.122	-0.111	-0.098	-0.08
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	6.447	7.392	8.359	8.361	8.637	9.291	9.721	10.015	10.212	10.338	10.414	10.452	10.465	9.753	8.827	8.10

GRAY BACKGROUND

NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.890	0.849	0.836	0.840	0.840	0.834	0.830	0.827	0.825	0.824	0.823	0.823	0.823	0.834	0.848	0.85

Exhibit A-8 (continued)

PLUME CONTRAST AT 0.55 MICRONS	0.010	-0.022	-0.043	-0.047	-0.052	-0.059	-0.064	-0.067	-0.068	-0.070	-0.070	-0.071	-0.071	-0.065	-0.058	-0.05
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	3.975	5.865	6.657	6.541	6.612	6.954	7.194	7.361	7.472	7.541	7.580	7.596	7.598	7.086	6.425	5.90
BLACK BACKGROUND																
NX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DISTANCE (KM)	1	2	5	10	20	40	60	80	100	120	140	160	180	200	220	240
REDUCTION OF VISUAL RANGE (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
BLUE-RED RATIO	0.637	0.648	0.689	0.726	0.752	0.767	0.773	0.775	0.777	0.778	0.780	0.781	0.782	0.798	0.817	0.83
PLUME CONTRAST AT 0.55 MICRONS	0.192	0.128	0.069	0.042	0.021	0.003	-0.005	-0.010	-0.013	-0.016	-0.017	-0.018	-0.018	-0.018	-0.017	-0.01
PLUME PERCEPTIBILITY DELTA E(L*A*B*)	9.360	9.262	8.329	7.441	6.937	6.827	6.857	6.901	6.932	6.946	6.947	6.941	6.931	6.427	5.801	5.32

Exhibit A-8 (concluded)

APPENDIX B

PLUVUE SOURCE CODE

The listing of the FORTRAN source code for PLUVUE, as used on the SAI Prime 750 computer, is contained in this section. The various subprogram listings are on the following pages:

Subprogram	Page
MAIN	259
ERF	313
PERDIF	314
CHROMA	316
SYTVA	317
SZTVA	318
SYPAS	319
SZPAS	320
INRAD	321
RAYREF	326
BACCLN	327
BACOBJ	328
PLMCLN	329
PLMOBJ	331
BSIZE	335
ALGN	336
SOLARZ	337
SPLNA	339
MAPGTU	341
VVGTU1	343
MAPUTG	341
DAMIE	346
PLMAX	351
CLOCK	353
PLMIN	354

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The user should expect to perform a minor conversion before the program will compile and execute properly on any computer other than Prime. PLUVUE was written with standard FORTRAN to be as portable as possible.

```
(0001)   C ************************************************************************
(0002)   C
(0003)   C
(0004)   C                                  PLUVUE
(0005)   C
(0006)   C                            PLUME VISIBILITY MODEL
(0007)   C
(0008)   C      THIS MODEL WAS DEVELOPED FOR :
(0009)   C
(0010)   C                     U. S. ENVIRONMENTAL PROTECTION AGENCY
(0011)   C                OFFICE OF AIR QUALITY PLANNING AND STANDARDS
(0012)   C                     RESEARCH TRIANGLE PARK, NC 27111
(0013)   C
(0014)   C      BY
(0015)   C
(0016)   C                               DOUGLAS A. LATIMER
(0017)   C                              ROBERT W. BERGSTROM
(0018)   C                                CLARK D. JOHNSON
(0019)   C                                   HENRY HOGO
(0020)   C
(0021)   C                            SYSTEMS APPLICATIONS, INC.
(0022)   C                                 950 NORTHGATE DRIVE
(0023)   C                                 SAN RAFAEL, CA 94903
(0024)   C
(0025)   C                                    (415) 472-4011
(0026)   C
(0027)   C      IT IS RECOMMENDED THAT THE USER OF THIS MODEL REFER TO EPA'S
(0028)   C      SERIES OF TECHNICAL GUIDANCE DOCUMENTS ON VISIBILITY, INCLUDING
(0029)   C      THE "WORKBOOK FOR ESTIMATING VISIBILITY IMPAIRMENT" AND THE "USERS
(0030)   C      MANUAL FOR THE PLUME VISIBILITY MODEL (PLUVUE)", AND THE FOLLOWING
(0031)   C      DOCUMENTS:
(0032)   C
(0033)   C           (1)  U. S. ENVIRONMENTAL PROTECTION AGENCY (OCTOBER, 1979),
(0034)   C                "PROTECTING VISIBILITY:  AN EPA REPORT TO CONGRESS",
(0035)   C                EPA-450/5-79-008.
(0036)   C
(0037)   C           (2)  LATIMER, D. A. ET AL. (SEPTEMBER, 1978), "DEVELOPMENT
(0038)   C                OF MATHEMATICAL MODELS FOR THE PREDICTION OF ANTHROPOGENIC
(0039)   C                VISIBILITY IMPAIRMENT", EPA-450/3-78-110A,B,C, SYSTEMS
(0040)   C                APPLICATIONS, INCORPORATED, SAN RAFAEL, CALIFORNIA.
(0041)   C
(0042)   C
(0043)   C ************************************************************************
(0044)   C
(0045)   C
(0046)   C      PROGRAM PLUVUE(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7)
(0047)          COMMON/BCKGND/ ELEV,RVAMB,ACCAMB,AMBNO2,RH,ROVA,ROVC,ROVS,ROVP,
(0048)         1SICA,SICC,SICS,SIGP,HPBL,IREAD,CORAMB,AMBNO3,AMBSO4,INTYP
(0049)         2,DENA,DENC,DENP,DENS
(0050)          DIMENSION SPECR(39),SPECB(39),SPECO(39),SPECP(39)
(0051)          COMMON/MIESCT/ROG,SIGMA,NLAMB,LAMB(20),JX,IT,TT(200),DUM(20),
(0052)         1PDUM(20,200)
(0053)          COMMON / OPTDEP / TAUOIZ(39),TAUHIZ(39),TAUOHZ(39),X1(39),
(0054)         1X2(39),TAUTDI(39),TAUTOD(39),XHDI(39),XHOD(39)
(0055)          COMMON/ MISC/ ABSNO2(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(0056)         1,NTHETA
```

Exhibit B-1. PLUVUE Source Code.

```
(0057)          COMMON/RADPRP/BTAS04(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(0058)         1PAER(39,27),PPRIM(39,27),PS04(39,27),PCOR(39,27),BTABAC(39)
(0059)          COMMON/COLOR/YCAP,VAL,X,Y,YCAPD,VALD,XD,YD,DELUV,DELAB,
(0060)         1XBAR(39),YBAR(39),ZBAR(39),PI,CONT1,CONT2,CONT3,BRATIO
(0061)          COMMON /SOL/ EFFDEC, HRANGL
(0062)          DIMENSION ALT(6),AA(4),DIST(16),PLANT(6),
(0063)         1XPART1(16,6),XN021(16,6),QN021(6),XPARTP(16,6),XPARTS(16,6)
(0064)          DIMENSION ROBJ(7),REFL(3)
(0065)          DIMENSION XQ(6),CH1QIY(6),RS02(17),RNOX(16),STABLE(7)
(0066)          DIMENSION TER(16),OBSPLU(16),AZMUTH(16),AALPHA(16),ABETA(16)
(0067)         1,ROBJT(16),ROBJCT(24)
(0068)          DIMENSION PLT1(16,4),PLT2(16,4),PLT3(16,4),PLT4(16,4),
(0069)         1PLOT1(16,4),PLOT2(16,4),PLOT3(16,4),PLOT4(16,4)
(0070)          DIMENSION RS02R(17,6,17),RNOXR(17,6,17),QS02TR(6,16),QNOXTR(6,16),
(0071)         1 QS04TR(6,16),QN03TR(6,16),QPARTT(6,16),RATIOT(6,16),PHIKKR(24),
(0072)         1 QJ(24),RN02X(17,6,17)
(0073)    C
(0074)    C   IF NUMBER OF DOWNWIND DISTANCES > 16, INCREASE ABOVE DIMENSIONS.
(0075)    C
(0076)          DIMENSION P(7)
(0077)          DATA P/0.10,0.15,0.20,0.25,0.30,0.30,0.30/
(0078)          DATA AA/30.,45.,60.,90./
(0079)          DATA ALT /4HH+2S,4HH+1S,1HH,4HH-1S,4HH-2S,2H 0/
(0080)          DATA STABLE/2H A,2H B,2H C,2H D,2H E,2H F,2H G/
(0081)          DATA NX1 /1/
(0082)          DATA ROBJ/0.02,0.05,0.10,0.20,0.50,0.80,1.0/
(0083)          DATA REFL/1.,0.3,0./
(0084)    C
(0085)    C   SPECIAL SYSTEM CALL FOR PRIME COMPUTER TO ALLOW PRINT FILE TO EXTEND
(0086)    C   OUT TO 132 COLUMNS.
(0087)    C
(0088)    C       CALL ATTDEV(INTS(6),INTS(7),INTS(2),INTS(66))
(0089)          PI=3.14159
(0090)          RAD=PI/180.
(0091)    C
(0092)    C ********************************************************************************
(0093)    C
(0094)    C READ IN DATA (METEOROLOGICAL, PLANT EMISSIONS, AND AMBIENT AIR QUALITY
(0095)    C
(0096)    C ********************************************************************************
(0097)    C
(0098)    99    CONTINUE
(0099)          READ(5,1) (PLANT(J),J=1,6)
(0100)    1     FORMAT (6A4)
(0101)    C
(0102)    C READ IN U(M/S), STABILITY INDEX, LAPSE RATE(DEG F/1000 FT).  I IS
(0103)    C STABILITY INDEX.  FOR PASQUILL-GIFFORD STABILITY CLASSES,
(0104)    C I=1 FOR "A", 2 FOR "B", 3 FOR "C", ETC.
(0105)    C
(0106)          READ (5,2) U,I,ALAPSE
(0107)          IS=I
(0108)    C
(0109)    C   IUSFC=0 FOR WIND SPEED ALOFT, NON-ZERO FOR SURFACE.
(0110)    C   INEW=NEW STABILITY INDEX. NXSTAB IS DOWN WIND DISTANCE INDEX WHERE
(0111)    C   NEW STABILITY STARTS.  SET NXSTAB TO NX2+1 AND INEW=I FOR NO
(0112)    C   STABILITY CHANGE.
```

Exhibit B-1 (Continued)

```
(0113)  C
(0114)        READ(5,2001) IUSFC, INEW, NXSTAB
(0115)  2     FORMAT (F5.1,I5,F5.2,F5.1)
(0116)  C
(0117)  C  READ INITIAL PLUME HORIZONTAL AND VERTICAL DIMENSIONS
(0118)  C  FOR A NON-POINT SOURCE.
(0119)  C
(0120)        READ(5,9)YINITL,ZINITL
(0121)  C
(0122)  C   READ IN PLANETARY BOUNDARY HEIGHT (MIXING DEPTH) IN METERS.
(0123)  C   THIS IS THE LIMIT ON VERTICAL MIXING OF EMISSIONS.  IF SET TO ZERO,
(0124)  C   THERE IS NO LIMIT.
(0125)  C
(0126)        READ(5,7) HPBLM
(0127)  C
(0128)  C  SET PBL HEIGHT TO 2 KM FOR BACKGROUND POLLUTANTS FOR OPTICS
(0129)  C  CALCULATIONS ONLY.
(0130)  C
(0131)        HPBL=2.
(0132)  C
(0133)  C   READ IN RELATIVE HUMIDITY IN PERCENT
(0134)  C
(0135)        READ(5,8) RH
(0136)  C
(0137)  C   READ INDICATOR FOR TYPE OF STABILITY SCHEME.  IDIS=0 FOR PASQUILL-
(0138)  C  GIFFORD, 1 FOR TVA.
(0139)  C
(0140)        READ(5,801) IDIS
(0141)  C
(0142)  C    FLAGS FOR OPTICS ANALYSIS ROUTINES.  IFLG1=1 FOR HORIZONTAL SIGHT
(0143)  C    PATH VIEWS.  IFLG2=1 FOR NON-HORIZONTAL SIGHT PATHS.  IFLG3=1 FOR
(0144)  C    BACKGROUND OBJECT VIEWS.  IFLG4=1 FOR SIGHT PATHS ALONG THE PLUME
(0145)  C    CENTERLINE. NT1= STARTING INDEX FOR SCATTERING ANGLE ARRAY FOR
(0146)  C    RADIATIVE TRANSFER AND SCATTERING CALCULATIONS.  NT2= ENDING INDEX
(0147)  C    FOR SCATTERRING ANGLE CALCULATIONS.  NORMALLY, NT1 IS SET TO 1
(0148)  C    AND NT2 IS SET TO 7 FOR THE 7 GENERIC SCATTERING ANGLES AND
(0149)  C    THESE VALUES SHOULD BE USED WHENEVER A OBSERVER-BASED RUN (NC1=1)
(0150)  C    IS BEING MADE.  FOR A GENERIC CASE RUN, NT1 AND NT2 CAN BE SET
(0151)  C    TO LIMIT CALCULATIONS FOR LESS THAN THE 7 ANGLES. EXAMPLE:  FOR
(0152)  C    A GENERIC RUN FOR CALCULATIONS AT 90 DEGREES ONLY, NT1=3 AND
(0153)  C    NT2=4.  NX2= ENDING INDEX FOR ARRAY OF DOWNWIND DISTANCES OF
(0154)  C    POINTS FOR OPTICS CALCULATIONS.  NZF=1 FOR CALCULATIONS AT
(0155)  C    PLUME CENTERLINE ONLY, 2 FOR OPTICS CALCULATIONS AT PLUME
(0156)  C    CENTERLINE AND AT GROUND LEVEL.
(0157)  C
(0158)        READ(5,2001)  IFLG1, IFLG2, IFLG3, IFLG4, NX2, NT1, NT2, NZF
(0159)  2001  FORMAT(10I2)
(0160)  C
(0161)  C  SWITCH FOR TURNING ON PRINT OUT OF TABLE FOR INITIAL PLUME DILUTION.
(0162)  C  IDILU=0 FOR NO TABLE, 1 FOR TABLE.
(0163)  C
(0164)        READ(5,2001) IDILU
(0165)  C
(0166)  C   READ IN DOWNWIND DISTANCES FOR OPTICS CALULATIONS (KILOMETERS).
(0167)  C   IT IS RECOMMENDED THAT THE FIRST 4 DOWNWIND DISTANCES BE SET TO
(0168)  C   1., 2., 5., AND 10. KM.
```

Exhibit B-1 (Continued)

```
(0169)   C
(0170)          READ(5,9)(DIST(I),I=1,NX2)
(0171)   9      FORMAT(8F10.0)
(0172)   C
(0173)   C    CONVERT DOWNWIND DISTANCES FROM KILOMETERS TO METERS
(0174)   C
(0175)          DO 32 I=1,NX2
(0176)   32     DIST(I)=DIST(I)*1000.
(0177)   C
(0178)   C     READ IN SO2, NOX, AND PARTICULATE EMISSION RATES IN TONS/DAY
(0179)   C     FOR ALL STACKS COMBINED.  (SHORT TONS = 2000 LB, NOT METRIC TONS)
(0180)   C
(0181)          READ (5,3) QSO2,QNOX,QPART
(0182)   C
(0183)   3      FORMAT (3F10.2)
(0184)   C
(0185)   C     READ IN FLUE GAS FLOW RATE PER STACK (CU FT PER MIN), FLUE GAS
(0186)   C     EXIT TEMPERATURE (DEG F), FLUE GAS OXYGEN CONCENTRATION (MOLE-
(0187)   C     PERCENT), FLUE GAS EXIT VELOCITY (M/S)
(0188)   C
(0189)          READ (5,4) FLOW,FGTEMP,FGO2,WMAX
(0190)   4      FORMAT (3F10.1,F10.2)
(0191)   C
(0192)   C     READ IN NUMBER OF STACKS AND STACK HEIGHT.
(0193)   C
(0194)          READ (5,5) UNITS,HSTACK
(0195)   5      FORMAT (2F5.1)
(0196)   6      FORMAT (F10.0)
(0197)   C
(0198)   C     READ IN AMBIENT AIR TEMPERATURE AT STACK HEIGHT.
(0199)   C
(0200)          READ (5,7) TAMB
(0201)   7      FORMAT (F10.1)
(0202)   C
(0203)   C     READ IN AMBIENT BACKGROUND POLLUTANT CONCENTRATION IN PPM
(0204)   C     OF NOX, NO2, O3, AND SO2.
(0205)   C
(0206)          READ(5,8) AMBNOX,AMBNO2,O3AMB,AMBSO2
(0207)    8     FORMAT(5F10.3)
(0208)   C
(0209)   C     READ IN AEROSOL SIZE DISTRIBUTION DATA.  ROVA=MASS MEAN RADIUS
(0210)   C     FOR BACKGROUND ACCUMULATION MODE (.1 TO 1 MICROMETER).  ROVC =
(0211)   C     MASS MEAN RADIUS FOR BACKGROUND COARSE MODE (> 1 MICROMETER).
(0212)   C     ROVS = MASS MEAN RADIUS FOR PLUME SECONDARY AEROSOL.  ROVP =
(0213)   C     MASS MEAN RADIUS FOR PLUME PRIMARY AEROSOL.  SIGA = GEOMETRIC
(0214)   C     STANDARD DEVIATION OF RADIUS OF BACKGROUND ACCUMULATION MODE.
(0215)   C     SIGC = GEOMETRIC STANDARD DEVIATION OF BACKGROUND COARSE MODE
(0216)   C     AEROSOL.  SIGS = GEOMETRIC STANDARD DEVIATION OF RADIUS OF
(0217)   C     PLUME SECONDARY AEROSOL.  SIGP GEOMETRIC STANDARD DEVIATION OF
(0218)   C     RADIUS OF PLUME PRIMARY PARTICULATE.  DENA=DENSITY (G/CM**3) OF
(0219)   C     BACKGROUND ACCUMULATION MODE AEROSOL.  DENC = DENSITY OF BACKGROUND
(0220)   C     COARSE MODE AEROSOL.  DENS = DENSITY OF PLUME SECONDARY AEROSOL
(0221)   C     AND DENP = DENSITY OF PLUME PRIMARY AEROSOL.
(0222)   C
(0223)          READ(5,8) ROVA,ROVC,ROVS,ROVP
(0224)          READ(5,8) SIGA,SIGC,SIGS,SIGP
```

Exhibit B-1 (Continued)

```
(0225)          READ(5,8) DENA,DENC,DENS,DENP
(0226)    C
(0227)    C     READ IN AMBIENT COARSE MODE AEROSOL CONCENTRATION  (BACKGROUND,)
(0228)    C     IN UG/M.
(0229)    C
(0230)          READ(5,8) CORAMB
(0231)    C
(0232)    C     INTYP = PARAMETER TO DETERMINE INPUT DATA.  IF INTYP=1,
(0233)    C     BACKGROUND SO4 AND NO3 CONCENTRATIONS ARE INPUT AND MODEL
(0234)    C     COMPUTES BACKGROUND VISUAL RANGE.  IF INTYP .NE. ONE,
(0235)    C     BACKGROUND VISUAL RANGE IS INPUT AND MODEL COMPUTES BACKGROUND
(0236)    C     ACCUMULATION MODE CONCENTRATION.
(0237)    C
(0238)          READ(5,801) INTYP
(0239)     801  FORMAT(I5)
(0240)          IF(INTYP.EQ.1) GO TO 802
(0241)    C
(0242)    C     READ IN BACKGROUND VISUAL RANGE.
(0243)    C
(0244)          READ(5,8) RVAMB
(0245)          GO TO 803
(0246)    C
(0247)    C     READ IN BACKGROUND SULFATE AND  NITRATE CONCENTRATIONS. (UG/M**3)
(0248)    C
(0249)     802  READ(5,8) AMBSO4,AMBNO3
(0250)     803  CONTINUE
(0251)    C
(0252)    C     READ IN DEPOSITION VELOCITIES. VDSO2 = DEPOSTION VEL FOR SO2.
(0253)    C     VDNOX = DEPOSITION VELOCITY FOR NOX.  VDCOR = DEP. VEL. FOR
(0254)    C     COARSE MODE PARTICULATE. VDSUB =DEPOSITION VELOCITY FOR
(0255)    C     SUB-MICRON PARTICULATE.  UNITS ARE CM/S.
(0256)    C
(0257)          READ(5,806) VDSO2,VDNOX,VDCOR,VDSUB
(0258)     806  FORMAT(16F5.2)
(0259)    C
(0260)    C     READ IN FLAG FOR SO2-TO-SO4 CONVERSION RATE (IN ADDITION TO OH
(0261)    C     CHEMISTRY) TO BE CONSTANT WITH DOWNWIND DISTANCE (ICON=0) OR
(0262)    C     TO CHANGE WITH DISTANCE FROM THE SOURCE (ICON=1).
(0263)    C
(0264)          READ(5,801) ICON
(0265)    C
(0266)    C     READ IN SO2-TO-SO4 CONVERSION RATE (%/HR) TO BE ADDED TO RATE
(0267)    C     CALCULATED FROM OH CHEMISRY.
(0268)    C
(0269)          READ(5,46) RSO2C
(0270)     46   FORMAT(8F10.7)
(0271)          IF(ICON.EQ.1) GO TO 826
(0272)          DO 79 NX=1,NX2
(0273)     79   RSO2(NX)=RSO2C
(0274)          GO TO 807
(0275)    C
(0276)    C   READ IN SO2-TO-SO4 CONVERSION RATE TO BE ADDED TO RATE CALCULATED BY
(0277)    C   OH MODEL, WITH VALUES CORRESPONDING TO EACH OF THE ANALYSIS POINTS
(0278)    C   DOWNWIND FROM THE SOURCE.
(0279)    C
(0280)     826  READ(5,46)(RSO2(NX),NX=1,NX2)
```

Exhibit B-1 (Continued)

```
(0281)    807  CONTINUE
(0282)    C
(0283)    C   NC1 AND NC2 CONTROL OUTPUT
(0284)    C   NC1=1,NC2=1 FOR STANDARD TABLES ONLY (NOT SITE SPECIFIC)
(0285)    C   NC1=2,NC2=2 FOR SITE SPECIFIC TABLES ONLY
(0286)    C   NC1=1, NC2=2 FOR BOTH TABLES-- SITE SPECIFIC AND STANDARD
(0287)    C
(0288)          READ(5,808)NC1,NC2
(0289)          IF(NC1.EQ.2)GO TO 825
(0290)    C
(0291)    C    READ IN INDICES FOR CONTROLLING PLUME-BASED DATA SAVED FOR PLOTTING.
(0292)    C
(0293)          READ(5,2001)NPP,NAP,NTP,NZP,IO1P,IPP
(0294)    825   IF(NC2.EQ.1)GO TO 816
(0295)    C
(0296)    C     FOR RUNS WITH SPECIFIC CASE CALCULATIONS, INCREASE NUMBER OF
(0297)    C     SCATTERING ANGLES FOR ALL THE SPECIFIC VIEWER LINE-OF-SIGHT
(0298)    C     GEOMETRIES.
(0299)    C
(0300)          NTHETA=7+NX2
(0301)    C
(0302)    C     READ IN OBSERVER POSITION:  UTM X-COORDINATE (KM), UTM Y-COORDINATE
(0303)    C     (KM), ELEVATION (FT,MSL) FOR OBSERVER-BASED CALCULATIONS.
(0304)    C
(0305)          READ(5,4)XOBS,YOBS,ZOBS
(0306)    C
(0307)    C     READ IN SOURCE POSITION:  UTM X-COORDINATE, Y-COORDINATE, ELEVATION
(0308)    C     FOR ALL RUNS.
(0309)    C
(0310)    816   READ(5,4)XSTACK,YSTACK,ZSTACK
(0311)    C
(0312)    C     READ UTM GRID ZONE NUMBER, MONTH, DAY, TIME (24 HOUR MILITARY),
(0313)    C     TIME ZONE NUMBER, AND YEAR.
(0314)    C    IZONE IS THE UNIVERSAL TRANSVERSE MERCATOR GRID ZONE NUMBER
(0315)    C    READ FROM A USGS MAP
(0316)    C    TZONE IS THE TIME ZONE NUMBER, COUNTING WEST FROM GREENWICH,
(0317)    C    ADD ONE FOR DAYLIGHT SAVINGS TIME.
(0318)    C
(0319)          READ(5,808)IZONE,IMO,IDAY,  TIME,TZONE,IYEAR
(0320)      808 FORMAT(3I5,2F5.0,I5)
(0321)    C
(0322)    C     SKIP OVER READ STATEMENTS IF RUN IS FOR A PLUME-BASED CASE ONLY.
(0323)    C
(0324)          IF(NC2.EQ.1)GO TO 818
(0325)    C
(0326)    C     READ IN ELEVATION OF TERRAIN AT EACH DOWNWIND POINT (FT MSL).  IF
(0327)    C     TER(1)=0, MODEL SETS UP FLAT TERRAIN FOR ALL POINTS.  THESE CHANGES
(0328)    C     ARE USED ONLY IN THE CALCULATION OF THE ELEVATION ANGLE BETA OF THE
(0329)    C     SPECIFIC LINES OF SIGHT USED FOR THE OBSERVER-BASED CALCULATIONS.
(0330)    C     THE GAUSSIAN DISPERSION CALCULATIONS USE FLAT TERRAIN.
(0331)    C
(0332)          READ(5,809)(TER(I),I=1,NX2)
(0333)          IF(TER(1).NE.0.) GO TO 8080
(0334)          DO 8079 I=1,NX2
(0335)          TER(I)=ZSTACK
(0336)     8079 CONTINUE
```

Exhibit B-1 (Continued)

```
(0337)    8080 CONTINUE
(0338)   C
(0339)   C     READ IN BACKGROUND OBJECT DISTANCES FROM OBSERVER THROUGH PLUME
(0340)   C     TO BACKGROUND TERRAIN FOR LINE-OF-SIGHT AZIMUTHS OF 15 DEG.,
(0341)   C     30 DEG., 45 DEG., ... , 360 DEG.  THE DISTANCE FOR EACH LINE-
(0342)   C     OF-SIGHT AZIMUTH ACTUALLY USED IS INTERPOLATED FROM THESE VALUES.
(0343)   C     IF ROBJCT(I) = 0, THE OBJECT DISTANCE IS SET EQUAL TO THE PLUME-
(0344)   C     OBSERVER DISTANCE ALONG THE LINE-OF-SIGHT TO THE ITH DOWNWIND POINT.
(0345)   C
(0346)          READ(5,809)(ROBJCT(NAZ),NAZ=1,24)
(0347)     809 FORMAT(8F10.1)
(0348)   C
(0349)   C     READ IN WIND DIRECTION IN DEGREES FROM NORTH (FROM WHICH WIND IS
(0350)   C     BLOWING).
(0351)   C
(0352)          READ(5,7)WIND
(0353)   818    WRITE (6,10)
(0354)   10     FORMAT (1H1)
(0355)          WRITE  (6,11) (PLANT(J),J=1,6)
(0356)   11     FORMAT (30H VISUAL IMPACT ASSESSMENT FOR ,6A4//)
(0357)          WRITE (6,12) ZSTACK
(0358)   12     FORMAT (5X,21HEMISSIONS SOURCE DATA//10X,20HELEVATION OF SITE = ,
(0359)         1 F10.0,10H  FEET MSL)
(0360)   C
(0361)   C CONVERT ELEVATION FROM FEET TO METERS
(0362)   C
(0363)          ELEV = ZSTACK/3.281
(0364)          WRITE (6,13) ELEV
(0365)    13    FORMAT (30X,F10.0,12H  METERS MSL,/)
(0366)          WRITE (6,14) UNITS
(0367)    14    FORMAT (10X,15HNO. OF UNITS = ,F6.0,/)
(0368)          WRITE (6,15) HSTACK
(0369)    15    FORMAT (10X,15HSTACK HEIGHT = ,F5.0,6H  FEET)
(0370)   C
(0371)   C CONVERT STACK HEIGHT FROM FEET TO METERS
(0372)   C
(0373)          HSTACK = HSTACK/3.281
(0374)          WRITE (6,16) HSTACK
(0375)    16    FORMAT (25X,F5.0,8H  METERS,/)
(0376)          WRITE (6,17) FLOW
(0377)    17    FORMAT(10X,21HFLUE GAS FLOW RATE = ,F10.0,11H  CU FT/MIN)
(0378)   C
(0379)   C CONVERT FLUE GAS FLOW RATE FROM CU FT/MIN TO CU METERS/SEC
(0380)   C
(0381)          FLOW = FLOW/(3.281**3.*60.)
(0382)          WRITE (6,18) FLOW
(0383)    18    FORMAT (31X,F10.2,10H  CU M/SEC,/)
(0384)          WRITE (6,19) FGTEMP
(0385)    19    FORMAT (10X,23HFLUE GAS TEMPERATURE = ,F10.0,3H  F)
(0386)   C
(0387)   C CONVERT FLUE GAS TEMPERATURE FROM F TO K
(0388)   C
(0389)          FGTEMP = (FGTEMP+459.67)/1.8
(0390)          WRITE (6,20) FGTEMP
(0391)    20    FORMAT(33X,F10.0,3H  K,/)
(0392)          WRITE (6,21) FGO2
```

Exhibit B-1 (Continued)

```
(0393)    21   FORMAT(10X,26HFLUE GAS OXYGEN CONTENT = ,F10.1,13H  MOL PERCENT,/)
(0394)   C
(0395)   C CONVERT FCO2 IN MOL PERCENT TO QO2 IN PPM BY VOLUME
(0396)   C
(0397)         QO2 = FCO2*1.E4
(0398)         WRITE (6,22) QSO2
(0399)   22    FORMAT (10X,28HSO2 EMISSION RATE (TOTAL) = ,F10.2,
(0400)        1        10H  TONS/DAY)
(0401)   C
(0402)   C CONVERSION FACTOR TONS/DAY TO GRAMS PER SEC
(0403)   C
(0404)         C1 = 2000.*453.6/(24.*3600.)
(0405)         QSO2 = QSO2*C1
(0406)         WRITE (6,23) QSO2
(0407)    23   FORMAT (38X,1PE12.3,7H  G/SEC,/)
(0408)         WRITE (6,24) QNOX
(0409)   24    FORMAT (10X,35HNOX EMISSION RATE (TOTAL,AS NO2) = ,F10.2,
(0410)        1       10H  TONS/DAY)
(0411)         QNOX = QNOX*C1
(0412)         WRITE (6,231) QNOX
(0413)    231  FORMAT(45X,1PE12.3,7H  G/SEC,/)
(0414)         WRITE (6,25) QPART
(0415)   25    FORMAT (10X,36HPARTICULATE EMISSION RATE (TOTAL) = ,F10.2,
(0416)        1       10H  TONS/DAY)
(0417)         QPART = QPART*C1
(0418)         WRITE(6,231) QPART
(0419)         WRITE(6,10)
(0420)         WRITE (6,26) U
(0421)   26    FORMAT (///5X,43HMETEOROLOGICAL AND AMBIENT AIR QUALITY DATA//10X,
(0422)        1           12HWINDSPEED = ,F5.1,10H  MILES/HR)
(0423)   C
(0424)   C CONVERT WIND SPEED FROM MILES/HR TO M/SEC
(0425)   C
(0426)         U = U*0.447
(0427)         WRITE (6,27) U
(0428)         WRITE(6,271)
(0429)         IF(IDIS.EQ.9) WRITE(6,281)
(0430)    281  FORMAT(10X,45HDISPERSION COEFFICIENTS ARE USER-INPUT VALUES)
(0431)         I=IS
(0432)         IF(IDIS.EQ.1) WRITE(6,282) I
(0433)    282  FORMAT(10X,19HTVA STABILITY INDEX,I2)
(0434)         IF(IDIS.EQ.0) WRITE(6,283) STABLE(I)
(0435)    283  FORMAT(10X,42HPASQUILL-GIFFORD-TURNER STABILITY CATEGORY,A2)
(0436)    27   FORMAT(1H ,21X,F5.1,7H  M/SEC)
(0437)         WRITE(6,271)
(0438)    271  FORMAT(5X)
(0439)   28    FORMAT (10X,18HSTABILITY INDEX = ,I2)
(0440)         WRITE (6,29) ALAPSE
(0441)    29   FORMAT(10X,13HLAPSE RATE = ,F5.2,11H  F/1000 FT)
(0442)   C
(0443)   C CONVERT LAPSE RATE FROM F/1000 FT TO K/M
(0444)   C
(0445)         ALAPSE = ALAPSE*3.281/(1000.*1.8)
(0446)         WRITE (6,30) ALAPSE
(0447)    30   FORMAT (23X,1PE12.3,5H  K/M,/)
(0448)   C
```

Exhibit B-1 (Continued)

```
(0449)  C CONVERT TO POTENTIAL TEMPERATURE BY ADDING DRY ADIABATIC LAPSE RATE
(0450)  C
(0451)        ALAPSE = ALAPSE + 9.8E-3
(0452)  C
(0453)  C     TO PREVENT POSSIBLE DIVIDE BY ZERO IN CALCULATION OF STABILITY
(0454)  C     PARAMETER S IN PLUME RISE,CHECK IF ALAPSE = 0.
(0455)  C
(0456)        IF(ALAPSE.EQ.0.)ALAPSE=.1E-30
(0457)        WRITE (6,31) ALAPSE
(0458)  31    FORMAT (10X,33HPOTENTIAL TEMPERATURE LAPSE RATE = ,1PE12.3,
(0459)       1          3H  K/M,/)
(0460)        WRITE (6,33) TAMB
(0461)   33   FORMAT(10X,22HAMBIENT TEMPERATURE = ,F5.1,3H  F)
(0462)  C
(0463)  C CONVERT AMBIENT TEMPERATURE FROM F TO K
(0464)  C
(0465)        TAMB = (TAMB + 459.67)/1.8
(0466)        WRITE (6,34) TAMB
(0467)   34   FORMAT(32X,F5.1,3H  K,/)
(0468)        WRITE(6,341) RH
(0469)        RH=RH/100.
(0470)   341  FORMAT(10X,20HRELATIVE HUMIDITY = ,F5.1,3H  %,/)
(0471)        WRITE(6,342) HPBLM
(0472)   342  FORMAT(10X,15HMIXING DEPTH = ,F5.0,3H  M,/)
(0473)  C
(0474)  C  CALCULATION OF AMBIENT PRESSURE IN ATMOSPHERES FROM ELEVATION IN M MSL
(0475)  C
(0476)        PAMB = EXP(-1.15E-4*ELEV)
(0477)  C
(0478)  C  CALCULATE WATER CONCENTRATION IN PPM
(0479)  C
(0480)        WATER =(6030.*RH/PAMB)*EXP(4884.*(1./273.-1./TAMB))
(0481)        WRITE (6,40) PAMB
(0482)        WRITE(6,271)
(0483)  40    FORMAT (10X,19HAMBIENT PRESSURE = ,F5.2,5H  ATM)
(0484)        WRITE (6,35) AMBNOX
(0485)        WRITE(6,271)
(0486)  35    FORMAT (10X,31HBACKGROUND NOX CONCENTRATION = ,F10.3,5H  PPM)
(0487)  C
(0488)  C     CONVERT UTM COORDINATES TO LAT, LONG.
(0489)  C     XSTACK = UTM EAST COORD., YSTACK= UTM NORTH COORD.
(0490)  C  IZONE= UTM ZONE NUMBER
(0491)  C     ALON=LONGITUDE IN DECREES, ALAT= LATITUDE IN DECREES
(0492)  C
(0493)        CALL MAPUTC(XSTACK,YSTACK,IZONE,ALON,ALAT)
(0494)  C
(0495)  C CALCULATE SOLAR ZENITH ANGLE.
(0496)  C
(0497)        TIME1=CLOCK(TIME,-2)
(0498)        CALL SOLARZ(ALAT,ALON,TZONE,IYEAR,IMO,IDAY,TIME1,SUNEL,3)
(0499)        SINAL=COS(EFFDEC)*SIN(HRANGL)/SIN((90.-SUNEL)*RAD)
(0500)        CALL SOLARZ(ALAT,ALON,TZONE,IYEAR,IMO,IDAY, TIME,SUNELE,3)
(0501)        ZENITH=90.-SUNELE
(0502)  C
(0503)  C    CALCULATE SOLAR AZIMUTH ANGLE FOR LATE AM
(0504)  C
```

Exhibit B-1 (Continued)

```
(0505)          SINA=COS(EFFDEC)*SIN(HRANGL )/SIN(ZENITH*RAD)
(0506)          SUNAZ=180.-ASIN(SINA)/RAD
(0507)    C
(0508)    C     SUN AZIMUTH FOR EARLY AM
(0509)    C
(0510)          IF(TIME .LT. 1030. .AND. SINA .GT. SINAL)SUNAZ=ASIN(SINA)/RAD
(0511)    C
(0512)    C     SUN AZIMUTH FOR EARLY PM
(0513)    C
(0514)          IF(TIME .GT. 1030. .AND. SINA .GT. SINAL)SUNAZ=180.+ASIN(SINA)/RAD
(0515)    C
(0516)    C     SUN AZIMUTH FOR LATE PM
(0517)    C
(0518)          IF(TIME .GT. 1430. .AND. SINA .LT. SINAL)SUNAZ=360.-ASIN(SINA)/RAD
(0519)    C
(0520)    C      CALCULATE DYNAMIC EQUILIBRIUM CONSTANT FOR NO2 - NO
(0521)    C      BRANCH IF ZENITH > 90 DEGREES AND SET CONSTANT TO ZERO.
(0522)    C
(0523)          IF(ZENITH.GE.90.) GO TO 351
(0524)          PHIKK=(1.E-2/0.44)*EXP(-0.38/COS(PI/180.*ZENITH))
(0525)          GO TO 352
(0526)     351  PHIKK=0.0
(0527)     352  CONTINUE
(0528)          SUM=AMBNOX+AMBNO2+O3AMB+PHIKK
(0529)          XNO2=0.5*(SUM-SQRT(SUM*SUM-4.*AMBNOX*(O3AMB+AMBNO2)))
(0530)          IF(XNO2.GT.AMBNOX) XNO2=AMBNOX
(0531)          DIF=XNO2-AMBNO2
(0532)          AMBNO2=XNO2
(0533)          IF(DIF.GT.0.0005) GO TO 352
(0534)          WRITE (6,36) AMBNO2
(0535)          WRITE(6,271)
(0536)    36    FORMAT (10X,31HBACKGROUND NO2 CONCENTRATION = ,F10.3,3H  PPM)
(0537)          WRITE (6,37) O3AMB
(0538)          WRITE(6,271)
(0539)    37    FORMAT (10X,33HBACKGROUND OZONE CONCENTRATION = ,F10.3,3H  PPM)
(0540)          WRITE(6,370) AMBSO2
(0541)     370  FORMAT(10X,31HBACKGROUND SO2 CONCENTRATION = ,F10.3,3H  PPM,/)
(0542)          ELEV=ELEV/1000.
(0543)      811 CONTINUE
(0544)          IF(IUSFC.EQ.0)GO TO 817
(0545)    C
(0546)    C   CORRECT 7 METER WIND TO STACK HEIGHT
(0547)    C
(0548)          USFC=U
(0549)          IF(IDIS.EQ.1)GO TO 821
(0550)    C
(0551)    C    CORRECTION IF PASQUILL-GIFFORD STABILITY CLASS
(0552)    C
(0553)          U=USFC*(HSTACK/7.)**P(I)
(0554)          GO TO 817
(0555)    821   CONTINUE
(0556)    C
(0557)    C    CORRECTION IF TVA STABILTY CLASS
(0558)    C
(0559)          P(1)=0.25
(0560)          DO 822 II=2,6
```

Exhibit B-1 (Continued)

```
(0561)   822    P(I1)=0.30
(0562)          U=USFC*(HSTACK/7.)**P(I)
(0563)   C
(0564)   C      PLUME RISE CALCULATION (FROM CRSTER MANUAL (BRIGGS))
(0565)   C      BOUYANCY FLUX
(0566)   C
(0567)     817  F=(9.8*FLOW/PI)*(FGTEMP-TAMB)/FGTEMP
(0568)   C
(0569)   C      PLUME RISE FOR STABLE CONDITIONS
(0570)   C      STABILITY PARAMETER S
(0571)   C
(0572)          S=(9.8/TAMB)*ALAPSE
(0573)          SMIN=(9.8/TAMB)*9.8E-4
(0574)          IF(S.LT.SMIN)GO TO 812
(0575)          XFINAL=PI*U/SQRT(S)
(0576)          RISE =2.6*(F/(U*S))**0.333334
(0577)          RISE2=3.*(F**0.25)*(S**(-3./8.))
(0578)          IF(RISE2.LT.RISE )RISE=RISE2
(0579)          GO TO 815
(0580)     812  IF(F.GE.55.)GO TO 813
(0581)          XSTR=14.*F**(5./8.)
(0582)          GO TO 814
(0583)     813  XSTR=34.*F**(2./5.)
(0584)   814    XFINAL=3.5*XSTR
(0585)          RISE=1.6*(F**0.333334)*((3.5*XSTR)**.666667)/U
(0586)     815  B=HSTACK+RISE
(0587)   C
(0588)   C    CORRECT 7 METER WIND SPEED TO FINAL PLUME HEIGHT
(0589)   C
(0590)          IF(IUSFC.EQ.0)GO TO 823
(0591)          U=USFC*(H/7.)**P(I)
(0592)   823    CONTINUE
(0593)   C
(0594)   C     SKIP OVER SIT SPECIFIC GEOMETRY IF RUN IS FOR PLUME-BASED
(0595)   C     CALCULATIONS ONLY.
(0596)   C
(0597)          IF(NC2.EQ.1)GO TO 820
(0598)   C
(0599)   C     CONVERT WIND TO AZIMUTH OF PLUME TRAGECTORY IN RADIANS.
(0600)   C
(0601)          WIND=(WIND-180.)*RAD
(0602)   C
(0603)   C     CALCULATE OBSERVER AZIMUTH ANGLE, ELEVATION ANGLE (ABETA),
(0604)   C     AND HORIZONTAL ANGLE BETWEEN LINE-OF-SITE AND PLUME CENTERLINE
(0605)   C     FOR EACH DOWNWIND POINT (AALPHA).
(0606)   C
(0607)          DO 810  I=1,NX2
(0608)   C
(0609)   C     XPLUME = X COORDINATE OF DOWNWIND POINT IN KILOMETERS.
(0610)   C     YPLUME = Y COORDINATE OF DOWNWIND POINT IN KILOMETERS.
(0611)   C     ZPLUME = ELEVATION OF PLUME PARCEL (FT, MSL)
(0612)   C     OBSPLU(I) = DISTANCE IN KM FROM OBSERVER TO PLUME AT
(0613)   C     DOWNWIND POINT I.
(0614)   C
(0615)          XPLUME= XSTACK+DIST(I)/1000. *SIN(WIND)
(0616)          YPLUME= YSTACK+DIST(I)/1000. *COS(WIND)
```

Exhibit B-1 (Continued)

```
(0617)          ZPLUME=H*3.281+TER(I)
(0618)          OBSPLU(I)=((XPLUME-XOBS)**2+(YPLUME-YOBS)**2+((ZPLUME-ZOBS)/3.281/
(0619)         1 1000.)**2)**0.5
(0620)    C
(0621)    C     CALCULATE DELTAX, DELTAY AND DELTAZ BETWEEN PLUME PARCEL AND
(0622)    C     AND OBSERVER POSITION.
(0623)    C
(0624)          DELTAX=XPLUME-XOBS
(0625)          DELTAY=YPLUME-YOBS
(0626)          DELTAZ=(ZPLUME-ZOBS)/3281.
(0627)    C
(0628)    C     CALCULATE AZIMUTH OF OBSERVER SIGHTLINE.
(0629)    C
(0630)          AZMUTH(I)=ATAN2(DELTAX,DELTAY)/RAD
(0631)          IF(AZMUTH(I).LT.0.)AZMUTH(I)=AZMUTH(I)+360.
(0632)          AALPHA(I)=ACOS(COS(WIND)*COS(AZMUTH(I)*RAD)+SIN(WIND)*SIN(
(0633)         1 AZMUTH(I)*RAD))/RAD
(0634)          IF (AALPHA(I).GT.90.)AALPHA(I)=180.-AALPHA(I)
(0635)    C
(0636)    C     CALCULATION OF SCATTERING ANGLE BETWEEN DIRECT SOLAR RAY AND
(0637)    C     OBSERVER LINE-OF-SIGHT FOR EACH DOWNWIND POINT.
(0638)    C
(0639)          X1A=(DELTAX*SIN(SUNAZ*RAD)+DELTAY*COS(SUNAZ*RAD))*SIN(ZENITH
(0640)         1 *RAD)+DELTAZ*COS(ZENITH*RAD)
(0641)          X2A=OBSPLU(I)
(0642)          TT(I+7)=ACOS(X1A/X2A)/RAD
(0643)    C
(0644)    C     CALCULATION OF ANGLE OF OBSERVER LINE-OF-SIGHT ABOVE HORIZON.
(0645)    C
(0646)          ABETA(I)=ASIN(DELTAZ/OBSPLU(I))/RAD
(0647)    C
(0648)    C     INTERPOLATION OF DISTANCE TO BACKGROUND TERRAIN FOR THE AZIMUTH
(0649)    C     OF THE SPECIFIC LINE OF SIGHT FOR EACH DOWNWIND DISTANCE.  IF
(0650)    C     ROBJCT(I)=0., SET ROBJT(I)=OBSPLU(I).
(0651)    C
(0652)          IF(ROBJCT(I).EQ.0.)GO TO 824
(0653)          IF(AZMUTH(I).LT.15.)GO TO 805
(0654)          DO 804 IAZZ=1,23
(0655)          IAZ=IAZZ+1
(0656)          AZU=FLOAT(IAZZ)*15.
(0657)          AZUM=FLOAT(IAZ)*15.
(0658)          IF(AZMUTH(I).GE.AZU.AND.AZMUTH(I).LT.AZUM)GO TO 819
(0659)    804   CONTINUE
(0660)    C
(0661)    C     SPECIAL CALCULATION FOR AZIMUTH .LT. 15 DEGREES.
(0662)    C
(0663)    805   ROBJT(I)=ROBJCT(24)+(ROBJCT(1)-ROBJCT(24))*(AZMUTH(I)/15.)
(0664)          GO TO 810
(0665)    819   ROBJT(I)=ROBJCT(IAZZ)+(ROBJCT(IAZ)-ROBJCT(IAZZ))*((AZMUTH(I)-AZU)
(0666)         1 /15.)
(0667)          GO TO 810
(0668)    824   ROBJT(I)=0.
(0669)      810 CONTINUE
(0670)      820 CONTINUE
(0671)    C
(0672)    C ***************************************************************************
```

Exhibit B-1 (Continued)

```
(0673)  C
(0674)  C     CALCULATE BACKGROUND RADIATION CHARACTERISTICS :  SCATTERING,
(0675)  C     ABSORPTION, AND EXTINCTION COEFFICIENTS AND OPTICAL DEPTHS.
(0676)  C     ******CALL INRAD*******
(0677)  C
(0678)  C ***************************************************************************
(0679)  C
(0680)        CALL INRAD
(0681)        WRITE(6,371) CORAMB
(0682)   371  FORMAT(10X,39HBACKGROUND COARSE MODE CONCENTRATION = ,F10.1,7H  UG
(0683)       1/M3,/)
(0684)        WRITE(6,372) AMBSO4
(0685)   372  FORMAT(10X,35HBACKGROUND SULFATE CONCENTRATION = ,F10.1,7H  UG/M3,
(0686)       1/)
(0687)        WRITE(6,373) AMBNO3
(0688)   373  FORMAT(10X,35HBACKGROUND NITRATE CONCENTRATION = ,F10.1,7H  UG/M3,
(0689)       1/)
(0690)        WRITE(6,38) RVAMB
(0691)   38   FORMAT(10X,26HBACKGROUND VISUAL RANGE = ,F10.1,12H  KILOMETERS,/)
(0692)        WRITE(6,374) VDSO2
(0693)   374  FORMAT(10X,26HSO2 DEPOSITION VELOCITY = ,F10.2,8H  CM/SEC,/)
(0694)        WRITE(6,375) VDNOX
(0695)   375  FORMAT(10X,26HNOX DEPOSITION VELOCITY = ,F10.2,8H  CM/SEC,/)
(0696)        WRITE(6,376) VDCOR
(0697)    376 FORMAT(10X,41HCOARSE PARTICULATE DEPOSITION VELOCITY = ,F10.2,8H
(0698)       1CM/SEC,/)
(0699)        WRITE(6,377) VDSUB
(0700)   377  FORMAT(10X,44HSUBMICRON PARTICULATE DEPOSITION VELOCITY = ,F10.2,
(0701)       18H  CM/SEC,/)
(0702)        WRITE(6,271)
(0703)        WRITE(6,310)
(0704)  310   FORMAT(39X,18HAEROSOL STATISTICS)
(0705)        WRITE(6,271)
(0706)        WRITE(6,312)
(0707)  312   FORMAT(36X,10HBACKGROUND,32X,5HPLUME)
(0708)        WRITE(6,271)
(0709)  313   FORMAT(25X,12HACCUMULATION,11X,6HCOARSE,11X,12HACCUMULATION,11X,6H
(0710)       1COARSE)
(0711)        WRITE(6,313)
(0712)        WRITE(6,314)
(0713)  314   FORMAT(10X,11HMASS MEDIAN,8X,4HMODE,16X,4HMODE,16X,4HMODE,16X,4HMO
(0714)       1DE)
(0715)        WRITE(6,315)
(0716)  315   FORMAT(10X,6HRADIUS)
(0717)        WRITE(6,316)ROVA,ROVC,ROVS,ROVP
(0718)  316   FORMAT(10X,11HMICROMETERS,3X,F10.3,3(10X,F10.3))
(0719)        WRITE(6,271)
(0720)        WRITE(6,317)
(0721)  317   FORMAT(10X,9HGEOMETRIC)
(0722)        WRITE(6,318)
(0723)  318   FORMAT(10X,8HSTANDARD)
(0724)        WRITE(6,319)SIGA,SIGC,SIGS,SIGP
(0725)  319   FORMAT(10X,9HDEVIATION,7X,F10.3,3(10X,F10.3))
(0726)        WRITE(6,271)
(0727)        WRITE(6,320)
(0728)  320   FORMAT(10X,8HPARTICLE)
```

Exhibit B-1 (Continued)

```
(0729)            WRITE(6,321)
(0730)      321   FORMAT(10X,7HDENSITY)
(0731)            WRITE(6,322)DENA,DENC,DENS,DENP
(0732)      322   FORMAT(10X,9HG/(CM**3),7X,F10.3,3(10X,F10.3))
(0733)            IF(NC2.EQ.1) GO TO 387
(0734)            WRITE(6,10)
(0735)            WRITE(6,378)
(0736)      378 FORMAT(///5X,57HGEOMETRY OF USER-SPECIFIED PLUME-OBSERVER-SUN ORIE
(0737)           1NTATION,//)
(0738)            WIND=WIND/RAD+180.
(0739)            WRITE(6,379)WIND
(0740)      379 FORMAT(10X,26HWIND DIRECTION (DEGREES) =,F5.1/)
(0741)      387   WRITE(6,271)
(0742)            WRITE(6,380) TIME,IMO,IDAY
(0743)      380 FORMAT(10X,18HSIMULATION IS FOR ,F5.0,10H HOURS ON ,I2,1H/,I2,/)
(0744)            WRITE(6,381)ZENITH
(0745)      381 FORMAT(10X,30HSOLAR ZENITH ANGLE (DEGREES) =,F5.1,/)
(0746)            WRITE(6,382)SUNAZ
(0747)      382 FORMAT(10X,31HSOLAR AZIMUTH ANGLE (DEGREES) =,F8.1,///)
(0748)      C
(0749)      C     SKIP OVER SPECIFIC CASE DATA IF RUN IS FOR A PLUME-BASED
(0750)      C     CALCULATION ONLY.
(0751)      C
(0752)            IF(NC2.EQ.1) GO TO 386
(0753)            WRITE(6,383)
(0754)      383 FORMAT(10X,63HGEOMETRIES FOR LINES-OF-SIGHT THROUGH PLUME PARCELS
(0755)           1AT GIVEN DOWNWIND DISTANCES (X),//,4X,6HX (KM),3X, 7HAZIMUTH,
(0756)           2 8X,2HRP,5X,5HALPHA,6X,4HBETA,5X,5HTHETA)
(0757)            DO 385 NX=1,NX2
(0758)            XPLUME=DIST(NX)/1000.
(0759)            WRITE(6,384)XPLUME,AZMUTH(NX),OBSPLU(NX),AALPHA(NX),ABETA(NX),
(0760)           1 TT(NX+7)
(0761)      384 FORMAT(6F10.1)
(0762)      385 CONTINUE
(0763)      386 CONTINUE
(0764)      C
(0765)      C*****
(0766)      C***  WRITE OUT THE HEADER PAGE
(0767)      C*****
(0768)            WRITE(6,10000)
(0769)     10000 FORMAT(1H1,30X,21HBACKGROUND CONDITIONS,//)
(0770)            WRITE(6,10200)
(0771)     10200 FORMAT(1H ,4X,17HACCUMULATION MODE,24X,20HCOARSE PARTICLE MODE,23X
(0772)           1,21HPRIMARY PARTICLE MODE)
(0773)            WRITE(6,10300)
(0774)     10300 FORMAT(1H ,4X,11HMASS RADIUS,4X,5HSIGMA,3X,13HBSCAT.55/MASS,8X,
(0775)           1 11HMASS RADIUS,4X,5HSIGMA,3X,13HBSCAT.55/MASS,8X,11HMASS RADIUS,
(0776)           2 4X,5HSIGMA,3X,13HBSCAT.55/MASS)
(0777)            WRITE(6,10400) ROVA,SIGA,BTAS04(19),ROVC,SIGC,BTACOR(19),ROVP,
(0778)           1SIGP,BTAPRM(19)
(0779)     10400 FORMAT(1H ,3E13.4,6X,3E13.4,5X,3E13.4)
(0780)     10600 FORMAT(1H ,3X,5HNOX =,E10.4,7H  NO2 =,E10.4,7H  NO3 =,E10.4,7H  SO
(0781)           12 =,E10.4,7H  SO4 =,E10.4,6H  O3 =,E10.4,5HACC =,E10.4,5HCOR =,
(0782)           1E10.4)
(0783)            WRITE(6,271)
(0784)            WRITE(6,10700)
```

Exhibit B-1 (Continued)

```
(0785)   10700 FORMAT(1H ,30X,40HCOEFFICIENTS AT 0.55 MICROMETERS , 1./KM)
(0786)         BTARAY = 0.01162*EXP(-ELEV/9.8)
(0787)   C
(0788)   C     BTARAY = RAYLEIGH SCATTERING COEFFICIENT.
(0789)   C
(0790)         ABNO2T = ABSNO2(19)*AMBNO2
(0791)   C
(0792)   C     ABNO2T = ABSORPTION COEFFICIENT FOR NO2 AT .55 MICROMETERS
(0793)   C     BTAAER(19) = BACKGROUND AEROSOL SCATTERING COEFFICIENT AT
(0794)   C     .55 MICROMETERS.
(0795)   C     BTABAC(19) = BACKGROUND EXTINCTION COEFFICIENT AT .55
(0796)   C     MICROMETERS.  THIS SUMS THE RAYLEIGH AND AEROSOL SCATTERING
(0797)   C     AND NO2 ABSORPTION.
(0798)   C
(0799)         WRITE(6,10800 ) BTARAY,BTAAER(19),ABNO2T,BTABAC(19)
(0800)   10800 FORMAT(1H ,6X,8HBTARAY =,E10.4,3X,8HBTAAER =,E10.4,3X,8HABSNO2 =,
(0801)        1 E10.4,3X,8HBTABAC =,E10.4,//)
(0802)   C***  WRITE(6,10900)
(0803)   10900 FORMAT(1H ,4X,40HNO.  WAVELN   TAT01Z     TAT0D1     PAER ,7F10.2)
(0804)   C***  WRITE(6,271)
(0805)   C
(0806)   C     LOOP ON WAVELENGTH
(0807)   C
(0808)         DO 20000 I = 1,39
(0809)   C
(0810)   C     WAVE = WAVELENGTH (MICROMETERS)
(0811)   C
(0812)         WAVE = 0.36 + 0.01*FLOAT(I)
(0813)   C
(0814)   C     TAUTOD(I) = OPTICAL DEPTH FROM SFC TO TOP OF MIXED LAYER.
(0815)   C     TAUTDI(I) = OPTICAL DEPTH FROM TOP OF MIXED LAYER TO TOP OF
(0816)   C     ATMOSPHERE.
(0817)   C     TAT0DI = OPTICAL DEPTH FROM SFC TO TOP OF ATMOSPHERE FOR THE
(0818)   C     ITH WAVELENGTH.
(0819)   C     PAER(I,J) = MIE SCATTERING PHASE FUNCTION FOR THE ITH
(0820)   C     WAVELENGTH AND THE JTH SCATTERING ANGLE.
(0821)   C
(0822)         TAT0DI = TAUTOD(I) + TAUTDI(I)
(0823)   C***  WRITE(6,11000 ) I,WAVE,TAT01Z(I),TAT0DI,(PAER(I,J),J=1,NTHETA)
(0824)   20000 CONTINUE
(0825)   11000 FORMAT(1H ,I5 ,10E11.4)
(0826)   C
(0827)   C     CALCULATE PERFECT DIFFUSE REFLECTOR PROPERTIES.
(0828)   C
(0829)         CALL PERDIF(SPECR,ZENITH)
(0830)   C***  WRITE(6,40010)
(0831)   C***  WRITE(6,40020)
(0832)   40010 FORMAT(1H1,4X,62HVISUAL EFFECTS CAUSED BY BACKGROUND ATMOSPHERE (W
(0833)        1ITHOUT PLUME))
(0834)   40020 FORMAT(5X,23H*** CLEAR SKY VIEWS ***,//)
(0835)   40025 FORMAT(/,5X,17HELEVATION (KM) = ,F5.1,5X,20HVISUAL RANGE (KM) = ,
(0836)        1F5.0,5X,15HACCUMULATION = ,F5.1,5X,17HNO2 CONC (PPM) = ,F5.2,/)
(0837)   C***  WRITE(6,40030)
(0838)   40030 FORMAT(6H THETA,5H BETA,4X,3HTAU,4X,4HYCAP,7X,1HL,7X,1HX,7X,1HY,8H
(0839)        1 DELYCAP,4X,4HDELL,2X,6HC(400),2X,6HC(550),2X,6HC(700),2X,6HBRATIO
(0840)        2,4X,4HDELX,4X,4HDELY,2X,6HE(LUV),2X,6HE(LAB))
```

Exhibit B-1 (Continued)

```
C ***********************************************************************

(0841)          DO 40100 I=1,6
(0842)    C
(0843)    C     LOOP FOR 6 PLUME-BASED SCATTERING ANGLES
(0844)    C
(0845)          ITHETA =I+1
(0846)          THETA=TT(ITHETA)
(0847)          IFLAGP=0
(0848)    C
(0849)    C     LOOP FOR 6 PLUME-BASED SIGHTLINE ELEVATION ANGLES
(0850)    C
(0851)          DO 40100 IBETA=1,7
(0852)          BETA=FLOAT(IBETA-1)*15.
(0853)    C
(0854)    C     SPECR = RAYLEIGH ATMOSPHERE INTENSITIES
(0855)    C     SPECB = BACKGROUND ATMOSPHERE INTENSITIES.
(0856)    C     CALCULATE RAYLEIGH ATMOSPHERE INTENSITIES FOR 39 WAVELENGTHS
(0857)    C
(0858)          CALL RAYREF    (ZENITH,BETA,THETA, ITHETA, SPECR)
(0859)    C
(0860)    C     CALCULATE BACKGROUND ATMOSPHERE INTENSITIES FOR 39 WAVELENGTHS
(0861)    C
(0862)          CALL BACCLN(ZENITH, BETA, THETA,ITHETA, SPECB)
(0863)    C
(0864)    C     CALCULATE VISUAL PERCEPTIBILITY PARAMETERS
(0865)    C
(0866)          CALL CHROMA(SPECB,SPECR)
(0867)          IF(BETA.EQ.0.) GO TO 40031
(0868)    C
(0869)    C     CORRECT BACKGROUND ATMOSPHERE OPTICAL DEPTH FOR NON-VERTICAL
(0870)    C     VIEWING ANGLE.
(0871)    C
(0872)          TAU=TAT0IZ(19)/SIN(BETA*RAD)
(0873)          GO TO 40032
(0874)    C
(0875)    C     OPTICAL DEPTH FOR HORIZONTAL VIEW.
(0876)    C
(0877)    40031 TAU=TAUT0D(19)+TAUTD1(19)
(0878)    40032 CONTINUE
(0879)          IF(IFLAGP.EQ.0) GO TO 40040
(0880)    C***  WRITE(6,40060) BETA,TAU,YCAP,VAL,X,Y,YCAPD,VALD,CONT1,CONT2,CONT3,
(0881)    C***  1BRATIO,XD,YD,DELUV,DELAB
(0882)          GO TO 40050
(0883)    40040 CONTINUE
(0884)    C***  WRITE(6,40070) THETA,BETA,TAU,YCAP,VAL,X,Y,YCAPD,VALD,CONT1,CONT2,
(0885)    C***  1CONT3,BRATIO,XD,YD,DELUV,DELAB
(0886)          IFLAGP = 1
(0887)    40050 CONTINUE
(0888)    40060 FORMAT(5X,F5.0,3F8.2,2F8.4,2F8.2,8F8.4)
(0889)    40070 FORMAT(/,2F5.0,3F8.2,2F8.4,2F8.2,8F8.4)
(0890)    40100 CONTINUE
(0891)          IFLAGQ=1
(0892)    C
(0893)    C     LOOP FOR 6 PLUME-BASED SCATTERING ANGLES
(0894)    C
(0895)          DO 40200 I=1,6
(0896)          IF(IFLAGQ.LT.0) GO TO 40131
```

Exhibit B-1 (Continued)

```
(0897)  C***   WRITE(6,40010)
(0898)  C***   WRITE(6,40120)
(0899)  C***   WRITE(6,40130)
(0900)  40120 FORMAT(5X,61H''' WHITE, GRAY, AND BLACK OBJECTS AT INDICATED DISTA
(0901)       1NCES ***,//)
(0902)  40130 FORMAT(6H THETA,2X,5HRO/RV,1X,7HREFLECT,4X,4HYCAP,7X,1HL,7X,1HX,7X
(0903)       1,1HY,8H DELYCAP,4X,4HDELL,2X,6HC(400),2X,6HC(550),2X,6HC(700),2X,6
(0904)       1HERATIO,4X,4HDELX,4X,4HDELY,2X,6HE(LUV),2X,6HE(LAB))
(0905)  40131 CONTINUE
(0906)        IFLAGQ=-1*IFLAGQ
(0907)  C
(0908)  C     ASSIGN SCATTERING ANGLE
(0909)  C
(0910)        ITHETA=I+1
(0911)        THETA=TT(ITHETA)
(0912)        IFLAGP=0
(0913)  C
(0914)  C     CALCULATE BACKGROUND ATMOSPHERE INTENSITIES WITHOUT PLUME
(0915)  C
(0916)        CALL BACCLN(ZENITH,0.,THETA,ITHETA,SPECR)
(0917)  C
(0918)  C     LOOP FOR DIFFERENT SHADES OF BACKGROUND OBJECTS.
(0919)  C
(0920)        DO 40200 K=1,3
(0921)  C
(0922)  C     K = 1 FOR WHITE OBJECTS, 2 FOR GRAY, 3 FOR BLACK
(0923)  C
(0924)        XLUMIN=REFL(K)/(2.*PI)
(0925)        DO 40200 J=1,7
(0926)  C
(0927)  C     LOOP FOR 7 PLUME-BASED BACKGROUND OBJECT DISTANCES AS FUNCTION
(0928)  C     OF AMBIENT VISUAL RANGE.
(0929)  C
(0930)        RO=ROBJ(J)*RVAMB
(0931)  C
(0932)  C     CALCULATE INTENSITIES FOR BACKGROUND OBJECT WITHOUT PLUME.
(0933)  C
(0934)        CALL BACOBJ(ZENITH,BETA,THETA,ITHETA,RO,SPECB,XLUMIN)
(0935)  C
(0936)  C     CALCULATE DIFFERENCE IN COLOR OF OBJECTS VIEWED THROUGH
(0937)  C     THE BACKGROUND ATMOSPHERE COMPARED WITH THAT VIEWED
(0938)  C     THROUGH A RAYLEIGH ATMOSPHERE.
(0939)  C
(0940)        CALL CHROMA(SPECB,SPECR)
(0941)        IF(IFLAGP.EQ.1) GO TO 40140
(0942)  C***   WRITE(6,40160) THETA, ROBJ(J),REFL(K),YCAP,VAL,X,Y,YCAPD,VALD,
(0943)  C***  1CONT1,CONT2,CONT3,BRATIO,XD,YD,DELUV,DELAB
(0944)        IFLAGP = 1
(0945)        GO TO 40150
(0946)  40140 CONTINUE
(0947)  C***   WRITE(6,40170) ROBJ(J),REFL(K),YCAP,VAL,X,Y,YCAPD,VALD,CONT1,CONT2
(0948)  C***  1,CONT3,BRATIO,XD,YD,DELUV,DELAB
(0949)  40150 CONTINUE
(0950)  40160 FORMAT(/,F5.0,4F8.2,2F8.4,2F8.2,8F8.4)
(0951)  40170 FORMAT(3X,4F8.2,2F8.4,2F8.2,8F8.4)
(0952)  40200 CONTINUE
```

Exhibit B-1 (Continued)

```
(0953)  C
(0954)  C    CONVERSION FACTOR FROM G/S TO MICRO-G/SEC AT REFERENCE CONDITIONS (1
(0955)  C    ATMOSPHERE) .  FOR ONE STACK INSTEAD OF TOTAL STACK EMISSIONS.
(0956)  C
(0957)         C2 = ((1.E6/UNITS)/PAMB)*(FGTEMP/298.)
(0958)  C
(0959)  C CONVERT G/S TO PPM-CU M/S FOR GASES AND TO MICRO-G/CU M - CU M/S FOR
(0960)  C     PARTICULATES.
(0961)         QSO2   = QSO2*C2* 3.821E-4
(0962)         QNOX   = QNOX*C2* 5.315E-4
(0963)         QPART  = QPART*C2
(0964)         Q02    = FCO2*1.E4*FLOW
(0965)         PI = 3.14159
(0966)         IF(IDILU .EQ.0)GO TO 45
(0967)         WRITE(6,10)
(0968)         WRITE (6,41) (PLANT(J),J=1,6)
(0969)  41     FORMAT (35X,62HINITIAL PLUME RISE AND DILUTION AND NITROGEN DIOXID
(0970)        1E FORMATION//45X,6A4//2X,4HTIME,5X,1HX,5X,7HDELTA H,4X,1HU,7X,1HW,
(0971)        17X,1HV,4X,5HSIGMA,4X,4HTEMP,5X,2HO2,4X,12HNO2-NO RATIO,5X,3HNOX,
(0972)        16X,2HNO,5X,4HNO2T,4X,3HSO2,3X,11HPARTICULATE/2X,5H(SEC),3X,3H(M),
(0973)        15X,3H(M),5X,5H(M/S),3X,5H(M/S),3X,5H(M/S),3X,3H(M),5X,3H(K),4X,
(0974)        15HMOL P,3X,5HEQUIL,3X,6HACTUAL,2X,5H(PPM),4X,5H(PPM),2X,5H(PPM),
(0975)        13X,5H(PPM),3X,5HUG/M3/)
(0976)  42     FORMAT (F7.0,2F8.1,3F8.2,3F8.1,1P2E8.1,0P4F8.3,1PE10.2)
(0977)  C
(0978)  C CALCULATE THE INTEGER CLOSEST TO THE NO.OF SECONDS AFTER EMISSION FROM
(0979)  C      THAT PLUME IS TRANSPORTED 1 KM
(0980)  C
(0981)  45     NSECF=1000./U
(0982)  C
(0983)  4300   CONTINUE
(0984)  C
(0985)  C
(0986)  C
(0987)  C DO LOOP LAGRANGIAN FRAME OF REFERENCE (EVERY 10 SECONDS)
(0988)  C
(0989)         NSECF1=NSECF+1
(0990)         DO 50 NSEC = 1,NSECF1,10
(0991)         T = NSEC-1
(0992)         IF(T.EQ.0.0) GO TO 43
(0993)  C
(0994)  C CALCULATION OF PARCEL VELOCITY, POSITION,DILUTION FACTOR
(0995)  C
(0996)  C     POWER LAW RISE OF PLUME TO EFFECTIVE STACK HEIGHT.
(0997)  C
(0998)  C
(0999)  C     CHANGE FOR F = 0.0
(1000)  C
(1001)         IF(XFINAL.EQ.0.0)GO TO 92
(1002)         DELH=RISE*(U*T/XFINAL)**.66667
(1003)         GO TO 93
(1004)  92     DELH=0.0
(1005)  93     CONTINUE
(1006)  C
(1007)  C     CORRECT DELH IF U*T > XFINAL
(1008)  C
```

Exhibit B-1 (Continued)

```
(1009)          IF(DELH.GT.RISE) DELH=RISE
(1010)   C
(1011)   C     CALCULATE VERTICAL VELOCITY VIA POWER LAW
(1012)   C
(1013)          W=.66667*RISE*FLOAT(NSECF)**(-0.66667)*FLOAT(NSEC)**(-.33333)
(1014)   C
(1015)   C     W =WMAX AT STACK, W = 0 AT XFINAL
(1016)   C
(1017)          IF(NSEC.GT.NSECF) W=0.
(1018)          IF (W.GT.WMAX) W=WMAX
(1019)   C
(1020)   C     VELOCITY VECTOR AT NSEC.
(1021)   C
(1022)          V = SQRT(U**2.+W**2.)
(1023)          DENOM = DELH**2*V*(1.57/2.15)/2.15
(1024)          IF (DENOM.LT.FLOW) DENOM=FLOW
(1025)          GO TO 44
(1026)   C
(1027)   C PROPERTIES AT TOP OF STACK
(1028)   C
(1029)   43     DELH = 0.0
(1030)          W = WMAX
(1031)          DENOM = FLOW
(1032)          V = W
(1033)   C
(1034)   C CALCULATION OF PLUME TEMPERATURE
(1035)   C
(1036)   44     TEMP = TAMB*DENOM/(DENOM-FLOW*(1.-(TAMB/FGTEMP)))
(1037)   C
(1038)   C DOWNWIND DISTANCE FROM STACK IN METERS
(1039)   C
(1040)          XM = U*T
(1041)   C
(1042)   C HORIZONTAL OR VERTICAL DISPERSION COEFFICIENT = 1/2.15 OF PLUME
(1043)   C RADIUS.  RADIUS = 1/2 OF PLUME RISE.
(1044)   C
(1045)          SIG = (DELH/2.)/2.15
(1046)   C
(1047)   C O2 CONCENTRATION IN PPM IN PLUME IS NEEDED TO CALCULATE NO2 FORMATION
(1048)   C
(1049)          XO2 = 209460. + (QO2 - FLOW*209460.)*TEMP/(DENOM*FGTEMP)
(1050)   C
(1051)   C O2 IN MOL PERCENT
(1052)   C
(1053)          PO2 = XO2*1.E-4
(1054)   C
(1055)   C CALCULATION OF EQUILIBRIUM NO2/NO RATIO
(1056)   C
(1057)          C3 = 16.786 + (8.341 - 16.786)*(TEMP-298.)/(500.-298.)
(1058)          RATIOE = SQRT(10.**C3*4.09E-11*XO2)
(1059)   C
(1060)   C ACTUAL NO2/NO RATIO. INITIALLY = EQUILIBRIUM. NEVER GREATER THAN EQUIL
(1061)   C
(1062)          IF(T.EQ.0.0) RATIOA= 8.03E-12*EXP(526.4/FGTEMP)*QNOX*FLOW
(1063)         1                     *XO2*ESTACK/W
(1064)          IF(RATIOA.GT.RATIOE) RATIOA = RATIOE
```

Exhibit B-1 (Continued)

```
(1065)   C
(1066)   C POLLUTANT CONCENTRATIONS. NO2 RESULTING FROM TERMOLECULAR REACTION ONLY
(1067)   C
(1068)         XNOX = QNOX*TEMP/(DENOM*FGTEMP)
(1069)         XSO2 = QSO2*TEMP/(DENOM*FGTEMP)
(1070)         XPART = QPART*TEMP/(DENOM*FGTEMP)
(1071)         XNO = XNOX/(1.+RATIOA)
(1072)         XNO2T = XNO*RATIOA
(1073)         IF(IDILU .EQ. 0)GO TO 50
(1074)         WRITE (6,42) T,XM,DELH,U,W,V,SIG,TEMP,PO2,RATIOE,RATIOA,XNOX,XNO,
(1075)        1              XNO2T,XSO2,XPART
(1076)   C
(1077)   C CALCULATION OF CHANGE IN NO2/NO RATIO VIA TERMOLECULAR REACTION IN 10
(1078)   C
(1079)   50     RATIOA=RATIOA+4.015E-12*EXP(1046./(1.987*TEMP))*XNO*XO2*10.
(1080)   C
(1081)   C EMISSION RATES PER STACK ARE CONVERTED BACK TO TOTALS.
(1082)   C
(1083)         QSO2 = QSO2*UNITS
(1084)         QNOX = QNOX*UNITS
(1085)         QPART = QPART*UNITS
(1086)   C
(1087)   C    CALCULATION OF VIRTUAL POINT SOURCE DISTANCE OFFSET
(1088)   C    SO THAT CALCULATED SIGMA-X AND SIGMA-Y MATCH INITIAL
(1089)   C    PLUME DILUTION RESULTS AT  1 KILOMETER.
(1090)   C
(1091)   C  IS = STABILITY CLASS
(1092)   C
(1093)   C
(1094)         I=IS
(1095)         IF(IDIS.EQ.9)GO TO 476
(1096)         DILUTE=((RISE*RISE/4.)/2.15)/2.15
(1097)         XM=XFINAL
(1098)         SIGYXZ=0.
(1099)   470   CONTINUE
(1100)         IF(IDIS.EQ.1) GO TO 471
(1101)         SY=SYPAS(I,XM)
(1102)         SZ=SZPAS(I,XM)
(1103)         GO TO 472
(1104)   471   SY=SYTVA(I,XM)
(1105)         SZ=SZTVA(I,XM)
(1106)   472   SIGYZI=SIGYXZ
(1107)         SIGYXZ=SY*SZ
(1108)         IF(DILUTE.LE.SIGYXZ.AND.SIGYZI.EQ.0.)GO TO 476
(1109)         IF(DILUTE.LE.SIGYXZ)GO TO 475
(1110)         XM=XM+1.E4
(1111)         GO TO 470
(1112)   475   XVIRTL=XM-XFINAL-1.E4+1.E4*(DILUTE-SIGYZI)/(SIGYXZ-SIGYZI)
(1113)         GO TO 477
(1114)   476   XVIRTL=0.
(1115)   477   CONTINUE
(1116)   C  CALCULATE PHOTOLYSIS RATE CONSTANTS FOR EACH OF 24 HOURLY PERIODS IN A
(1117)   C  DAY.
(1118)   C    CONVERT STACK UTM COORDINATES TO LATITUDE AND LONGITUDE.
(1119)   C
(1120)         CALL MAPUTG(XSTACK,YSTACK,IZONE,ALON,ALAT)
```

Exhibit B-1 (Continued)

```
(1121)          DO 49 I=1,24
(1122)    C
(1123)    C     TIMER = HOURS OF DAY (MILITARY CLOCK)
(1124)    C
(1125)          TIMER=FLOAT(I)*100.
(1126)    C
(1127)    C     CALCULATE SUN ELEVATION ANGLE
(1128)    C
(1129)          CALL SOLARZ(ALAT,ALON,TZONE,IYEAR,IMO,IDAY,TIMER,SUNELE,3)
(1130)          AZEN=90.-SUNELE
(1131)          IF(AZEN.GT.90.)AZEN=90.
(1132)          PHIKKR(I)=0.0
(1133)          QJ(I)=0.0
(1134)          IF(AZEN.EQ.90.)GO TO 48
(1135)    C
(1136)    C     DYNAMIC EQUILIBRIUM CONSTANT (NO2 AND NO)
(1137)    C
(1138)          PHIKKR(I)=(1.E-2/0.44)*EXP(-0.38/COS(AZEN*RAD))
(1139)    C
(1140)    C     OZONE PHOTOLYSIS RATE CONSTANT
(1141)    C
(1142)          QJ(I)=2.23E-5*60.*(COS(AZEN*RAD))**2.74
(1143)    48    CONTINUE
(1144)    49    CONTINUE
(1145)    C
(1146)    C ***************************************************************************
(1147)    C
(1148)    C DO LOOP FOR POLLUTANT CONCENTRATIONS AND VISUAL EFFECTS AT 16 DOWNWIND
(1149)    C DISTANCES
(1150)    C
(1151)    C ***************************************************************************
(1152)    C
(1153)          NZFLAG=0
(1154)    C
(1155)    C     INITIALIZE EFFECTIVE EMISSION RATES FOR SO2, NOX, SO4, NO3, AND
(1156)    C    PRIMARY PARTICULATE, AND CONVERSION RATES FOR SO2, NOX, AND NO2.
(1157)    C
(1158)          DO 495 NZ=1,6
(1159)          DO 495 NT=NX1,NX2
(1160)          QSO2TR(NZ,NT)=QSO2
(1161)          QNOXTR(NZ,NT)=QNOX
(1162)          QSO4TR(NZ,NT)=0.
(1163)          QNO3TR(NZ,NT)=0.
(1164)          QPARTT(NZ,NT)=QPART
(1165)          RSO2R(1,NZ,NT)=RSO2(1)
(1166)          RNOXR(1,NZ,NT)=0.
(1167)          RNO2X(1,NZ,NT)=0.
(1168)    C
(1169)    C     SET NO2/NO RATIO TO INITIAL VALUE CALCULATED EARLIER. SET TO ZERO
(1170)    C     AT SURFACE.
(1171)    C
(1172)          RATIOT(NZ,NT)=RATIOA
(1173)          IF(NZ.EQ.6)RATIOT(NZ,NT)=0.
(1174)    495   CONTINUE
(1175)          CHIQIY(6)=0.
(1176)          QPART0=QPART
```

Exhibit B-1 (Continued)

```
(1177)  C
(1178)  C     INITIALIZE VALUE FOR DOWNWIND DISTANCE OF PREVIOUS POINT.
(1179)  C
(1180)          XM=0.
(1181)  C
(1182)  C     INITIALIZE TOTAL DEPOSITION FOR SO2, NOX, PRIMARY PARTICULATE,
(1183)  C     SULFATE AND NITRATE.
(1184)  C
(1185)          TDSO2=0.
(1186)          TDNOX=0.
(1187)          TDPART=0.
(1188)          TDSO4=0.
(1189)          TDNO3=0.
(1190)  C
(1191)  C     *****LOOP ON DOWNWIND DISTANCE *******
(1192)  C
(1193)          DO 1000 NX = NX1,NX2
(1194)  C
(1195)  C     XM0 = DOWNWIND DISTANCE OF PREVIOUS POINT.
(1196)  C
(1197)          XM0=XM
(1198)  C
(1199)  C     XM = DOWNWIND DISTANCE (METERS)
(1200)  C
(1201)          XM=DIST(NX)
(1202)  C
(1203)  C     XKM = DOWNWIND DISTANCE (KILOMETERS)
(1204)  C
(1205)          XKM=XM/1000.
(1206)  C
(1207)  C    ADD IN VIRTUAL POINT SOURCE OFFSET TO ACCOUNT FOR INITIAL DILUTION
(1208)  C    DURING PLUME RISE.
(1209)  C
(1210)          XADD=XM+XVIRTL
(1211)  C
(1212)  C     IS = STABILITY
(1213)  C
(1214)          I = IS
(1215)  C
(1216)  C    NXSTAB = DOWNWIND DISTANCE INDEX FOR DISTANCE WHERE STABILITY CHANGES
(1217)  C
(1218)          IF(NX.GT.NXSTAB)GO TO 135
(1219)          IF(IDIS.NE.9) GO TO 510
(1220)  C
(1221)  C     IDIS = 9 FOR READING IN SPECIAL SIGMA VALUES FOR EACH DOWNWIND
(1222)  C     DISTANCE
(1223)  C
(1224)          READ(5,5) SY,SZ
(1225)          GO TO 136
(1226)    510   CONTINUE
(1227)          IF(IDIS.EQ.1) GO TO 511
(1228)  C
(1229)  C     PASQUILL-GIFFORD SIGMAS (I=1 FOR "A", 2 FOR "B", 3 FOR "C", ETC)
(1230)  C
(1231)          SY=SYPAS(I,XADD)+(YINITL/2.)/PI
(1232)          SZ=SZPAS(I,XADD)+(ZINITL/2.)/PI
```

Exhibit B-1 (Continued)

```
(1233)          GO TO 512
(1234)   C
(1235)   C     TVA SIGMAS
(1236)   C
(1237)    511   SY=SYTVA(I,XADD)+(YINITL/2.)/PI
(1238)          SZ=SZTVA(I,XADD)+(ZINITL/2.)/PI
(1239)    512   CONTINUE
(1240)   C
(1241)   C     IF UPWIND OF STABILITY CHANGE, JUMP AROUND
(1242)   C
(1243)          IF(NX.LT.NXSTAB)GO TO 136
(1244)   C
(1245)   C    NXSTAB=DOWNWIND DISTANCE INDEX WHERE STABILITY CHANGES
(1246)   C     NXSTAB MUST BE GREATER THAN 1
(1247)   C    I=STABILITY INDEX FOR FIRST PART OF PLUME.
(1248)   C    INEW=NEW STABILITY INDEX
(1249)   C    SYNEW=SIGMA-Y FOR NEW STABILITY.
(1250)   C    SZNEW=SIGMA-Z FOR NEW STABILITY.
(1251)   C    CODE FOR NEW STABILITY.  FIRST DETERMINE VIRTUAL DOWNWIND
(1252)   C    DISTANCE FOR NEW STABILITY TO AVOID LARGE PLUME DIMENSIONAL
(1253)   C    DISCONTINUITY AT STABILITY INTERFACE.
(1254)   C
(1255)    100   CONTINUE
(1256)          IF(IDIS.EQ.1)GO TO 101
(1257)          DISTA=5000.
(1258)          SYNEW=SYPAS(INEW,DISTA)
(1259)          DELSIG=SYNEW-SY
(1260)   C
(1261)   C     FIND VIRTUAL DISTANCE FOR NEW STABILITY WHERE DIFFERENCE IN
(1262)   C     SIGMA-Y FOR INITIAL STABILITY AND SIGMA-Y AT NEW STABILITY
(1263)   C     STOPS DECREASING AND STARTS INCREASING, WITH A DISTANCE
(1264)   C     INTERVAL OF 1 KM. ASSUME SYNEW IS FIRST LESS THAN SY, THEN AT SOME
(1265)   C     DISTANCE GOES THROUGH ZERO AND STARTS INCREASING.
(1266)   C
(1267)    140   DISTB=DISTA
(1268)          DISTA=DISTA+5000.
(1269)          SYNEW=SYPAS(INEW,DISTA)
(1270)          DELSG=SYNEW-SY
(1271)          IF(ABS(DELSG).GT.ABS(DELSIG))GO TO 141
(1272)          DELSIG=DELSG
(1273)          GO TO 140
(1274)    141   CONTINUE
(1275)   C
(1276)   C     VIRTUAL DISTANCE FOR NEW STABILITY FOR SIGMA-Y IS BETWEEN
(1277)   C     DISTB AND DISTA.
(1278)   C    CALCULATE DISTANCE OFFSET FOR FUTURE SY DETERMINATIONS.
(1279)   C
(1280)          DDISTY=DISTB+5000.*((0.-DELSIG)/(DELSG-DELSIG))-DIST(NX)
(1281)   C
(1282)   C     SAME PROCEDURE FOR SIGMA-Z
(1283)   C
(1284)          DISTA=5000.
(1285)          SZNEW=SZPAS(INEW,DISTA)
(1286)          DELSIG=SZNEW-SZ
(1287)    142   DISTB=DISTA
(1288)          DISTA=DISTA+5000.
```

Exhibit B-1 (Continued)

```
(1289)          SZNEW=SZPAS(INEW,DISTA)
(1290)          DELSG=SZNEW-SZ
(1291)          IF(ABS(DELSG).GT.ABS(DELSIG))GO TO 143
(1292)          DELSIG=DELSG
(1293)          GO TO 142
(1294)    143   CONTINUE
(1295)          DDISTZ=DISTB+5000.*((0.-DELSIG)/(DELSG-DELSIG))-DIST(NX)
(1296)          SY=SYNEW
(1297)          SZ=SZNEW
(1298)          GO TO 136
(1299)    C
(1300)    C    SAME PROCEDURE FOR TVA SIGMA-Y
(1301)    C
(1302)    101   DISTA=5000.
(1303)          SYNEW=SYTVA(INEW,DISTA)
(1304)          DELSIG=SYNEW-SY
(1305)    144   DISTB=DISTA
(1306)          DISTA=DISTA+5000.
(1307)          SYNEW=SYTVA(INEW,DISTA)
(1308)          DELSG=SYNEW-SY
(1309)          IF(ABS(DELSG).GT.ABS(DELSIG))GO TO 145
(1310)          DELSIG=DELSG
(1311)          GO TO 144
(1312)    145   CONTINUE
(1313)          DDISTY=DISTB+5000.*((0.-DELSIG)/(DELSG-DELSIG))-DIST(NX)
(1314)    C
(1315)    C     SAME PROCEDURE FOR TVA SIGMA-Z
(1316)    C
(1317)          DISTA=5000.
(1318)          SZNEW=SZTVA(INEW,DISTA)
(1319)          DELSIG=SZNEW-SZ
(1320)    146   DISTB=DISTA
(1321)          DISTA=DISTA+5000.
(1322)          SZNEW=SZTVA(INEW,DISTA)
(1323)          DELSG=SZNEW-SZ
(1324)          IF(ABS(DELSG).GT.ABS(DELSIG))GO TO 147
(1325)          DELSIG=DELSG
(1326)          GO TO 146
(1327)    147   CONTINUE
(1328)          DDISTZ=DISTB+5000.*((0.-DELSIG)/(DELSG-DELSIG))-DIST(NX)
(1329)    135   IF(NX.LE.NXSTAB)GO TO 136
(1330)    C
(1331)    C     CODE  FOR CALCULATING SIGMA-Y AND SIGMA-Z DOWNWIND
(1332)    C     OF STABILITY CHANGE.
(1333)    C     FIRST ADD DISTANCE OFFSET FOR NEW STABILITY BEFORE
(1334)    C     CALCULATING SY AND SZ
(1335)    C
(1336)          XMY=DIST(NX)+DDISTY
(1337)          XMZ=DIST(NX)+DDISTZ
(1338)          IF(IDIS.EQ.1)GO TO 122
(1339)          SY=SYPAS(INEW,XMY)
(1340)          SZ=SZPAS(INEW,XMZ)
(1341)          GO TO 136
(1342)    122   SY=SYTVA(INEW,XMY)
(1343)          SZ=SZTVA(INEW,XMZ)
(1344)    136   CONTINUE
```

Exhibit B-1 (Continued)

```
(1345)          WRITE (6,10)
(1346)          WRITE (6,51) (PLANT(J),J=1,6)
(1347)   51     FORMAT (25X,30HCONCENTRATIONS OF AEROSOL AND GASES CONTRIBUTED BY,
(1348)         1         //35X,6A4/)
(1349)          WRITE (6,52) XKM
(1350)   52     FORMAT(25H DOWNWIND DISTANCE (KM) =, F7.1)
(1351)          WRITE (6,53) H
(1352)   53     FORMAT(19H PLUME ALTITUDE (M) ,5X,1H=,F7.0)
(1353)          WRITE (6,54) SY
(1354)   54     FORMAT(12H SIGMA Y (M),12X,1H=,F7.0)
(1355)          WRITE (6,55) SZ
(1356)   55     FORMAT(12H SIGMA Z (M),12X,1H=,F7.0)
(1357)          WRITE(6,56) RSO2R(NX,3,NX)
(1358)    56    FORMAT(27H SO2-SO4 CONVERSION RATE=   ,F10.4,11H PERCENT/HR)
(1359)          WRITE(6,57) RNOXR(NX,3,NX)
(1360)    57    FORMAT(27H NOX-NO3 CONVERSION RATE=   ,F10.4,11H PERCENT/HR)
(1361)          WRITE(6,271)
(1362)          IFLAGP=0
(1363)   C
(1364)   C CALCULATE DECREASE OF SO2 AND NOX FLUX AND INCREASE IN PARTICULATE
(1365)   C FLUX  DUE TO SULFATE AND NITRATE FORMATION.
(1366)   C ALSO, CALCULATE THE DECREASE IN FLUX DUE TO SURFACE DEPOSITION.
(1367)   C
(1368)          NTT=0
(1369)   C    TIME IN HOURS AND DECIMAL FRACTION OF HOUR
(1370)          TIMEHR=AINT(TIME/100.)+AMOD(TIME,100.)/60.
(1371)   C
(1372)   C     CHECK IF FIRST DOWNWIND POINT
(1373)   C
(1374)          IF(NX.EQ.NX1)GO TO 68
(1375)   C
(1376)   C     TIME IN HOURS FOR TRANSPORT FROM PREVIOUS (NX-1) DOWNWIND POINT
(1377)   C
(1378)          DTIME=((DIST(NX)-DIST(NX-1))/U)/3600.
(1379)          GO TO 69
(1380)   68     DTIME=0.
(1381)   C
(1382)   C     TIME AT PREVIOUS DOWNWIND POINT
(1383)   C
(1384)   69     TIMER=TIMEHR-DTIME
(1385)   C
(1386)   C     NTT STOPS SURFACE DEPOSITION AT NIGHT
(1387)   C
(1388)          IF(TIMER.LT.7..OR.TIMER.GT.18.)NTT=1
(1389)   C
(1390)   C     CALCULATION OF DEPOSITION
(1391)   C
(1392)          YGRND=CHIQIY(6)*1000.
(1393)          DEPOT=YGRND*(XM-XM0)
(1394)   C
(1395)   C    SUPPRESS SURFACE DEPOSITION AT NIGHT (ASSUME STABLE STRATIFICATION)
(1396)   C     DEPOSITION OF PRIMARY PARTICULATE
(1397)   C
(1398)          DEPPAR=QPART*VDCOR*DEPOT*FLOAT(1-NTT)/100.
(1399)   C
(1400)   C    ADJUST EFFECTIVE PARTICULATE EMISSION RATE FOR DEPOSITION
```

Exhibit B-1 (Continued)

```
(1401)  C
(1402)        QPART=QPART-DEPPAR
(1403)  C
(1404)  C     LOOP ON DOWNWIND DISTANCES FROM PRESENT POSITION (DIST(NX)) TO
(1405)  C     FINAL POINT (DIST(NX2)).
(1406)  C
(1407)        DO 570 NT=NX,NX2
(1408)  C
(1409)  C     CALCULATE DEPOSITION FOR SO2, NOX, SO4, AND NO3
(1410)  C
(1411)        DEPSO2=QSO2TR(6,NT)*VDSO2*DEPOT*FLOAT(1-NTT)/100.
(1412)        DEPNOX=QNOXTR(6,NT)*VDNOX*DEPOT*FLOAT(1-NTT)/100.
(1413)        DEPSO4=QSO4TR(6,NT)*VDSUB*DEPOT*FLOAT(1-NTT)/100.
(1414)        DEPNO3=QNO3TR(6,NT)*VDNOX*DEPOT*FLOAT(1-NTT)/100.
(1415)  C
(1416)  C     LOOP ON ALTITUDE
(1417)  C
(1418)        DO 568 NZ=1,6
(1419)        FORSO2=((QSO2TR(NZ,NT)*RSO2R(NX,NZ,NT)/3.6E5)/U)*(XM-XM0)
(1420)        FORNOX=((QNOXTR(NZ,NT)*RNOXR(NX,NZ,NT)/3.6E5)/U)*(XM-XM0)
(1421)       1 *RNO2X(NX,NZ,NT)
(1422)  C
(1423)  C     ADJUST EFFECTIVE SO2 AND NOX EMISSION RATES FOR CONVERSION TO
(1424)  C     SECONDARY SPECIES AND FOR SURFACE DEPOSITION AFTER TRANSPORT
(1425)  C     FROM DIST(NX-1) TO DIST(NX).
(1426)  C
(1427)        QSO2TR(NZ,NT)=QSO2TR(NZ,NT)-FORSO2-DEPSO2
(1428)        QNOXTR(NZ,NT)=QNOXTR(NZ,NT)-FORNOX-DEPNOX
(1429)  C
(1430)  C     ADJUST EFFECTIVE SULFATE EMISSION RATE, INCLUDING SULFATE
(1431)  C     FORMATION AND SURFACE DEPOSITION.  (ADJUST MASS FLUX)
(1432)  C
(1433)        QSO4TR(NZ,NT)=QSO4TR(NZ,NT)
(1434)       1  +1.5/3.821E-4*FORSO2-DEPSO4
(1435)  C
(1436)  C  ADJUST NO3 MASS FLUX
(1437)  C
(1438)        QNO3TR(NZ,NT)=QNO3TR(NZ,NT)+FORNOX-DEPNO3
(1439)  C
(1440)  C     ADJUST PARTICULATE MASS FLUX FOR SULFATE FORMATION
(1441)  C
(1442)        QPARTT(NX,NT)=QPART+QSO4TR(NZ,NT)
(1443)   568  CONTINUE
(1444)        IF(NT.NE.NX)GO TO 569
(1445)  C
(1446)  C     CALCULATE TOTAL DEPOSITION TO DIST(NX) FOR SO2, NOX, PARTICULATE,
(1447)  C     SO4, AND NO3.
(1448)  C
(1449)        TDSO2=TDSO2+DEPSO2
(1450)        TDNOX=TDNOX+DEPNOX
(1451)        TDPART=TDPART+DEPPAR
(1452)        TDSO4=TDSO4+DEPSO4
(1453)        TDNO3=TDNO3+DEPNO3
(1454)  C
(1455)  C     CALCULATE RATIO OF TOTAL DEPOSITION TO EMISSION RATE
(1456)  C
```

Exhibit B-1 (Continued)

```
(1457)          FDSO2=TDSO2/QSO2
(1458)          FDNOX=TDNOX/QNOX
(1459)          FDPART=TDPART/QPART0
(1460)          FDSO4=((TDSO4/QSO2)/1.5)*3.821E-4
(1461)          FDNO3=((TDNO3/QNOX)/1.35)*5.315E-4
(1462)   369    CONTINUE
(1463)   370    CONTINUE
(1464)   C
(1465)   C DO LOOP FOR 6 ALTITUDES:  2*SIGMA-Z+H, SIGMA-Z+H, H, H -SIGMA-Z
(1466)   C     H -2*SIGMA-Z, SURFACE
(1467)   C
(1468)          DO 60 NZ = 1,6
(1469)          RNZ = NZ
(1470)          IF(NZ.EQ.6) GO TO 58
(1471)          Z = H + (3.-RNZ)*SZ
(1472)          IF(Z.LT.0.) Z=0.
(1473)          GO TO 59
(1474)   58     Z = 0.0
(1475)    59    CONTINUE
(1476)   C
(1477)   C     GAUSSIAN DIFFUSION CALCULATION
(1478)   C
(1479)          ARG1 = -0.5*(H+Z)*(H+Z)/SZ/SZ
(1480)          ARG2 = -0.5*(H-Z)*(H-Z)/SZ/SZ
(1481)   C
(1482)   C     PREVENTION OF EXPONENTIAL UNDERFLOW
(1483)   C
(1484)          IF(ARG1.LT.(-290.)) ARG1=-290.
(1485)          IF(ARG2.LT.(-290.)) ARG2=-290.
(1486)          CHIQ=((TAMB/FGTEMP)/(2.*PI*SY*SZ*U))*(EXP(ARG1)+EXP(ARG2))
(1487)          IF(CHIQ.LT.2.E-30)CHIQ=2.E-30
(1488)   C
(1489)   C     CHECK IF EQUILIBRIUM PLUME CENTERLINE HEIGHT IS ABOVE THE TOP
(1490)   C     OF THE MIXED LAYER.
(1491)   C
(1492)          IF(H.GT.HPBLM) GO TO 594
(1493)   C
(1494)   C     VIRTUAL SOURCE TO ACCOUNT FOR REFLECTION OFF CAPPING LAYER.
(1495)   C
(1496)          HPRIME=2.*HPBLM-H
(1497)   C
(1498)   C     IF Z IS GTR THAN TOP OF MIXED LAYER, CHANGE Z TO TOP OF MIXED
(1499)   C     LAYER.
(1500)   C
(1501)          IF(Z.GT.HPBLM) Z=HPBLM
(1502)   C
(1503)   C     REVISED CALCULATION FOR PLUME BELOW INVERSION.
(1504)   C
(1505)          ARG1 = -0.5*(H+Z)*(H+Z)/SZ/SZ
(1506)          ARG2 = -0.5*(H-Z)*(H-Z)/SZ/SZ
(1507)          ARG3=-0.5*(HPRIME-Z)*(HPRIME-Z)/SZ/SZ
(1508)          ARG4=-0.5*(HPRIME+Z)*(HPRIME+Z)/SZ/SZ
(1509)          IF(ARG3.LT. -290. ) ARG3=-290.
(1510)          IF(ARG4.LT. -290. ) ARG4=-290.
(1511)          CHIQ=(TAMB/FGTEMP)/(2.*PI*SY*SZ*U)*(EXP(ARG1)+EXP(ARG2)+EXP(ARG3)
(1512)         1 + EXP(ARG4))
```

Exhibit B-1 (Continued)

```
(1513)          IF(CHIQ.LT.2.E-30)CHIQ=2.E-30
(1514)    C
(1515)    C     FORMULA FOR UNIFORMLY MIXED CHI/Q.  CONCENTRATION CONSTANT IN Z
(1516)    C     FROM SURFACE TO INVERSION.
(1517)          CHIQ1=(TAMB/FGTEMP)/(SQRT(2.*PI)*SY*HPBLM*U)
(1518)    C
(1519)    C     BRANCH IF Z = PLUME CENTERLINE HEIGHT.
(1520)    C
(1521)          IF(NZ.EQ.3) GO TO 592
(1522)          IF(NZFLAG.EQ.1) CHIQ=CHIQ1
(1523)          GO TO 594
(1524)    C
(1525)    C     IF GAUSSIAN PLUME CENTERLINE CHI/Q < CHI/Q FOR UNIFORMLY MIXED
(1526)    C     CASE, SET FLAG TO USE CHI/Q FOR UNIFORMLY MIXED CASE.
(1527)    C
(1528)     592  IF(CHIQ.LT.CHIQ1) NZFLAG=1
(1529)          IF(NZFLAG.EQ.1) CHIQ=CHIQ1
(1530)     594  CONTINUE
(1531)    C
(1532)    C     BRANCH FOR FIRST DOWNWIND DISTANCE
(1533)    C
(1534)          IF(NX.EQ.1) GO TO 596
(1535)    C
(1536)    C     MAXIMUM CHI/Q CANNOT EXCEED CHI/Q FOR CENTERLINE AT PREVIOUS
(1537)    C     DOWNWIND POINT
(1538)    C
(1539)          XQMAX=XQ(3)
(1540)          IF(CHIQ.GT.XQMAX) CHIQ=XQMAX
(1541)     596  CONTINUE
(1542)    C
(1543)    C     SAVE CHI/Q VALUES FOR ALL 6 LEVELS.
(1544)    C
(1545)          XQ(NZ)=CHIQ
(1546)          CHIQIY(NZ)=CHIQ*SQRT(2.*PI)*SY
(1547)          CHIQIY(NZ)=CHIQ1Y(NZ)/1000.
(1548)    C
(1549)    C     OH MODEL FOR SULFATE AND NITRATE FORMATION.  CALCULATE CONVERSION
(1550)    C     FOR PLUME PARCEL AT PRESENT POSITION AS IT IS ADVECTED TO POINTS
(1551)    C     FARTHER DOWNWIND WHERE CONCENTRATIONS ARE CALCULATED.
(1552)    C   CALCULATE PLUME PARCEL CONCENTRATIONS CORRESPONDING TO THE PLUME
(1553)    C   PARCEL AT DOWNWIND DISTANCE NX WHICH  GETS TRANSPORTED TO
(1554)    C   DOWNWIND DISTANCE I. SO4 AND NO3 FORMATION RATES ARE CALCULATED FOR
(1555)    C   THE TIME CORRESPONDING TO PARCEL DISTANCE I.
(1556)    C
(1557)    C     TIME IN HOURS AND DECIMAL FRACTIONS
(1558)    C
(1559)          TIMEHR=AINT(TIME/100.)+AMOD(TIME,100.)/60.
(1560)          DO 5960 I=NX,NX2
(1561)    C
(1562)    C     TIME FOR TRANSPORT FROM PRESENT POSITION TO POINT DOWNWIND (DIST(I))
(1563)    C
(1564)          DTIME=((DIST(I)-DIST(NX))/U)/3600.
(1565)    C
(1566)    C     CALCULATE TIME OF DAY PARCEL WOULD BE AT PRESENT POINT (DIST(NX))
(1567)    C     IN ORDER TO BE TRANSPORTED  TO EACH POINT FARTHER DOWNWIND FOR
(1568)    C     TIME OF OPTICS CALCULATIONS.
```

Exhibit B-1 (Continued)

```
(1569)   C
(1570)          TIMER=TIMEHR-DTIME
(1571)   5961   IF(TIMER.GT.0.)GO TO 5962
(1572)   C
(1573)   C      CORRECT FOR NEGATIIVE CLOCK TIME
(1574)   C
(1575)          TIMER=TIMER+24.
(1576)          GO TO 5961
(1577)   5962   CONTINUE
(1578)   C
(1579)   C      IT1 = HOUR OF DAY FOR PARCEL AT DIST(NX)
(1580)   C
(1581)          IT1=INT(TIMER)
(1582)          IT2=IT1+1
(1583)          IF(IT2.EQ.25)IT2=1
(1584)   C
(1585)   C      RTIME = DECIMAL FRACTION OF TIME OF DAY (TIME BEYOND IT1)
(1586)   C
(1587)          RTIME=AMOD(TIMER,1.)
(1588)   C
(1589)   C      LINEAR INTERPOLATION OF NO2 - NO DYNAMIC EQUILIBRIUM CONSTANT
(1590)   C      AND INTERPOLATION OF PHOTOLYSIS RATE CONSTANT FOR TIME OF DAY
(1591)   C      WHEN PLUME PARCEL WOULD BE AT DIST(NX) AND BE TRANSPORTED TO
(1592)   C      TO DIST(NX+1), DIST(NX+2), ETC.
(1593)   C
(1594)          PHIKKA=PHIKKR(IT1)+RTIME*(PHIKKR(IT2)-PHIKKR(IT1))
(1595)          QJA=QJ(IT1)+RTIME*(QJ(IT2)-QJ(IT1))
(1596)   C
(1597)   C      CONCENTRATION OF SO2
(1598)   C
(1599)          XSO2R=QSO2TR(NZ,I)*CHIQ
(1600)   C
(1601)   C      CONCENTRATION OF NOX
(1602)   C
(1603)          XNOXR=QNOXTR(NZ,I)*CHIQ
(1604)   C
(1605)   C      CONCENTRATION OF NO2
(1606)   C
(1607)          XNO2TR=XNOXR*RATIOT(NZ,I)/(1.+RATIOT(NZ,I))
(1608)          SUMR=XNOXR+AMBNOX+O3AMB+XNO2TR+AMBNO2+PHIKKA
(1609)          XNO2R=0.5*(SUMR-SQRT(ABS(SUMR*SUMR-4.*(XNOXR+AMBNOX)*
(1610)         1 (O3AMB+XNO2TR+AMBNO2))))
(1611)   C
(1612)   C      NOX PLUME CONCENTRATION WITH AMBIENT BACKGROUND NOX ADDED.
(1613)   C
(1614)          TOTR=XNOXR+AMBNOX
(1615)          IF(XNO2R.GT.TOTR)XNO2R=TOTR
(1616)          IF(NX.EQ.NX2)GO TO 39
(1617)          RATIOT(NZ,I)=RATIOT(NZ,I)+4.915E-12*EXP(1046./(1.987*TAMB))*
(1618)         1 (TOTR-XNO2R)*209460.*(DIST(NX+1)-DIST(NX))/U
(1619)   39     CONTINUE
(1620)   C
(1621)   C      OZONE CALCULATION
(1622)   C
(1623)          XO3R=O3AMB-(XNO2R-XNO2TR-AMBNO2)
(1624)   C
```

Exhibit B-1 (Continued)

```
(1625)   C     OH RADICAL CONCENTRATION
(1626)   C
(1627)          XOHR=2.*QJA*3.4E5*WATER*XO3R/((4.45E10+3.4E5*WATER)*
(1628)         1 (2000.*XSO2R+14.E3*XNO2R))
(1629)   C
(1630)   C     MAXIMUM OH RADICAL CONCENTRATION
(1631)   C
(1632)          XOHRMX=4.87E-7*QJA/1.32E-3
(1633)          IF(XOHR.GT.XOHRMX) XOHR=XOHRMX
(1634)   C
(1635)   C     SO2, NOX, AND NO2  CONVERSION RATES
(1636)   C
(1637)          RSO2R(NX+1,NZ,I+1)=2000.*XOHR*60.*100.+RSO2(NX+1)
(1638)          RNOXR(NX+1,NZ,I+1)=14.E3*XOHR*60.*100.
(1639)          RNO2X(NX+1,NZ,I+1)=XNO2R/TOTR
(1640)   C
(1641)   C     BRANCH IF PLUME PARCEL NOT AT FINAL POSITION (I=NX)
(1642)   C
(1643)          IF(I.NE.NX)GO TO 5939
(1644)   C
(1645)   C     SAVE SO2 CONCENTRATION AND PARTICULATE CONCENTRATION.
(1646)   C
(1647)          XSO2=XSO2R
(1648)          XPART=QPART*CHIQ
(1649)   C
(1650)   C     CALCULATE  MOLE RATIO OF SULFATE TO INITIAL SO2 (%).
(1651)   C
(1652)          RATIOS= QSO4TR(NZ,I)/1.5 * 3.821E-4/QSO2*100.
(1653)   C
(1654)   C     SAVE OZONE, NOX, AND NO2 CONCENTRATIONS.
(1655)   C
(1656)          XO3=XO3R
(1657)          XNOX=XNOXR
(1658)          XNO2=XNO2R
(1659)   C
(1660)   C     SAVE EFFECTIVE EMISSION RATE OF NO2 AND SO4 FOR LEVEL NZ
(1661)   C
(1662)          QNO3=QNO3TR(NZ,I)
(1663)          QSO4=QSO4TR(NZ,I)
(1664)   C
(1665)   C    PERCENT NOX CONVERTED TO NO3 (NITRIC ACID VAPOR)
(1666)   C
(1667)          RNO3=(QNO3/QNOX)*100.
(1668)   C
(1669)   C     TOTAL NOX CONCENTRATION
(1670)   C
(1671)          TOT=TOTR
(1672)   C
(1673)   C     CALCULATE NO3 CONCENTRATION
(1674)   C
(1675)          XNO3=QNO3*CHIQ
(1676)   C
(1677)   C     CALCULATE EFFECTIVE NO2 EMISSION RATE
(1678)   C
(1679)          QNO2I(NZ)=XNO2R/CHIQ
(1680)          XNO2I(NX,NZ)=XNO2R
```

Exhibit B-1 (Continued)

```
(1681)   C
(1682)   C    CALCULATE MOLE RATIO OF HNO3 TO INITIAL NOX(%).
(1683)   C
(1684)         RATION=(QNO3TR(NZ,I)/QNOX)*100.
(1685)   5959  CONTINUE
(1686)   5960  CONTINUE
(1687)         IF(IFLAGP.EQ.1) GO TO 5616
(1688)   C
(1689)   C    WRITE OUT TITLES FOR PRINT FILE
(1690)   C
(1691)         WRITE(6,5611)
(1692)    5611 FORMAT(9H ALTITUDE,9X,3HNOX,7X,3HNO2,7X,4HNO3-,2X,8HNO2/NTOT,2X,
(1693)        19HNO3-/NTOT,5X,3HSO2,7X,4HSO4=,2X,9HSO4=/STOT,5X,2HO3,5X,7HPRIMARY
(1694)        2,1X,9HBSP-TOTAL,2X,9HBSPSN/BSP)
(1695)         WRITE(6,5612)
(1696)   5612  FORMAT(16X,5H(PPM),5X,5H(PPM),5X,5H(PPM),2(2X,8H(MOLE %)),5X,
(1697)        15H(PPM),3X,7H(UG/M3),2X,8H(MOLE %),5X,5H(PPM),3X,7H(UG/M3),1X,10H(
(1698)        210-4 M-1),3X,3H(%),/)
(1699)    5616 CONTINUE
(1700)   C
(1701)   C    NO2 PLUME INCREMENT
(1702)   C
(1703)         XNO2IN=XNO2-AMBNO2
(1704)         QNO2I(NZ)=XNO2IN/CHIQ
(1705)         XNO3=QNO3*CHIQ
(1706)   C
(1707)   C   TOTAL NO3 (PLUME + AMBIENT)
(1708)   C
(1709)         XNO3T=XNO3+AMBNO3
(1710)   C
(1711)   C   RATIO OF PLUME INCREMENT NO2 TO INITIAL NOX (%).
(1712)   C
(1713)         RNO2=(100.*(XNO2-AMBNO2)/CHIQ)/QNOX
(1714)   C
(1715)   C   IF (PLUME NO2 - AMBIENT NO2) IS SMALL, RATIO SET TO ZERO.
(1716)   C
(1717)         IF(XNO2IN.LT.0.0005)  RNO2 = 0.
(1718)   C
(1719)   C   MOLE RATIO OF TOTAL NO2 AND NO3 TO TOTAL NOX (PLUME + AMBIENT).
(1720)   C
(1721)         RNO2T=(XNO2/(TOT+XNO3T))*100.
(1722)         RNO3T=(XNO3T/(TOT+XNO3T))*100.
(1723)   C
(1724)   C   TOTAL SO2 CONCENTRATION IN PLUME (PLUME + AMBIENT)
(1725)   C
(1726)         XSO2T=XSO2+AMBSO2
(1727)   C
(1728)   C   SULFATE PLUME INCREMENT
(1729)   C
(1730)         XSO4=QSO4*CHIQ
(1731)   C
(1732)   C   SAVE PARTICULATE AND SULFATE PLUME INCREMENTS FOR ALONG PLUME
(1733)   C   OPTICAL ANALYSIS.
(1734)   C
(1735)         XPARTP(NX,NZ)=XPART
(1736)         XPARTS(NX,NZ)=XSO4
```

Exhibit B-1 (Continued)

```
(1737)   C
(1738)   C  TOTAL SULFATE CONCENTRATION.
(1739)   C
(1740)         XSO4T=XSO4+AMBSO4
(1741)   C
(1742)   C  RATIO OF TOTAL SO4 COMPONENT TO TOTAL SULFUR COMPONENT.
(1743)   C
(1744)         RSO4T=(XSO4T*3.821E-4/1.5)/(XSO2T+XSO4T*3.821E-4/1.5)
(1745)   C
(1746)   C  CONVERT TO PERCENT
(1747)   C
(1748)         RSO4T=RSO4T*100.
(1749)   C
(1750)   C  PLUME INCREMENT OF OZONE (THIS IS LESS THAN ZERO FOR NOX PLUMES).
(1751)   C
(1752)         XO3IN=XO3-O3AMB
(1753)   C
(1754)   C  TOTAL AEROSOL CONCENTRATION (PLUME PLUS BACKGROUND)
(1755)   C
(1756)         XPT = XPART + CORAMB + AMBSO4
(1757)   C
(1758)   C  EXTINCTION COEFFICIENT FOR PLUME PRIMARY PARTICULATE AND
(1759)   C  SULFATE AND CONVERT FROM 1/KM TO 1/METERS
(1760)   C
(1761)         BSP=10.*(BTAPRM(19)*XPART+BTASO4(19)*XSO4)
(1762)   C
(1763)   C  ADD IN BACKGROUND AEROSOL EXTINCTION
(1764)   C
(1765)         BSPT=BSP+10.*BTAAER(19)
(1766)   C
(1767)   C  RATIO OF SULFATE EXTINCTION COEFFICIENT IN PLUME TO TOTAL
(1768)   C  PLUME AEROSOL EXTINCTION COEFFICIENT (%).
(1769)   C
(1770)         RSEC=1000.*BTASO4(19)*XSO4/BSP
(1771)   C
(1772)   C  RATIO OF PLUME SULFATE EXTINCTION COEFFICIENT TO TOTAL
(1773)   C  AEROSOL EXTINCTION COEFFICIENT (%).
(1774)   C
(1775)         RSECT=1000.*BTASO4(19)*XSO4T/BSPT
(1776)         WRITE(6,5613) ALT(NZ)
(1777)         WRITE(6,5614) XNOX,XNO2IN,XNO3,RNO2,RATION,XSO2,XSO4,RATIOS,
(1778)        1XO3IN,XPART,BSP,RSEC
(1779)    5613 FORMAT(2X,A4)
(1780)    5614 FORMAT(11H INCREMENT!,12F10.3)
(1781)         WRITE(6,5615) TOT,XNO2,XNO3T,RNO2T,RNO3T,XSO2T,XSO4T,RSO4T,XO8,
(1782)        1XPT,BSPT,RSECT
(1783)         IFLAGP=1
(1784)    5615 FORMAT(11H TOTAL AMB!,12F10.3,/)
(1785)   C
(1786)   C  BRANCH AROUND IF NOT AT PLUME CENTERLINE HEIGHT.
(1787)   C
(1788)         IF(NZ.NE.3) GO TO 60
(1789)   C
(1790)   C  SAVE PLUME CENTERLINE CONCENTRATIONS, INCLUDING AMBIENT
(1791)   C  BACKGROUND CONTRIBUTION.
(1792)   C
```

Exhibit B-1 (Continued)

```
(1793)          XNO2C=XNO2
(1794)          XSO4C=XSO4T
(1795)          XPRMC=XPT
(1796)    60    CONTINUE
(1797)          WRITE(6,5622)
(1798)    5622 FORMAT(////62H CUMULATIVE SURFACE DEPOSITION (MOLE FRACTION OF INI
(1799)         1TIAL FLUX),/)
(1800)          WRITE(6,5617) FDSO2
(1801)    5617 FORMAT(1H ,16X,4HSO2!,F10.4)
(1802)          WRITE(6,5618) FDNOX
(1803)    5618 FORMAT(1H ,16X,4HNOX!,F10.4)
(1804)          WRITE(6,5619) FDPART
(1805)    5619 FORMAT(21H PRIMARY PARTICULATE!,F10.4)
(1806)          WRITE(6,5620) FDSO4
(1807)    5620 FORMAT(1H ,16X,4HSO4!,F10.4)
(1808)          WRITE(6,5621) FDNO3
(1809)    5621 FORMAT(1H ,16X,4HNO3!,F10.4)
(1810)    C
(1811)    C CALCULATION OF NO2 AND SO4 FLUXES TAKING INTO ACCOUNT THE NON-
(1812)    C UNIFORM MOLE RATIOS ACROSS THE PLUME.
(1813)    C
(1814)          QNO2I(3) = 0.39*QNO2I(3) + 0.485*QNO2I(2) + 0.125*QNO2I(1)
(1815)          QNO2I(2) = 0.39*QNO2I(2) + 0.61*QNO2I(1)
(1816)          QNO2I(4)   = 0.39*QNO2I(4) + 0.61*QNO2I(5)
(1817)          QSO4=0.39*QSO4TR(3,NX)+0.485*QSO4TR(2,NX)+0.125*QSO4TR(1,NX)
(1818)    C
(1819)    C  SKIP OVER HORIZONTAL SIGHT PATHS WITH SKY BACKGROUND OPTICS
(1820)    C  CALCULATION IF IFLG1 = 0 .
(1821)    C
(1822)          IF(IFLG1.EQ.0) GO TO 7001
(1823)    C
(1824)    C ***************************************************************************
(1825)    C
(1826)    C VISUAL EFFECTS (HORIZONTAL SIGHT PATHS) ******************************
(1827)    C
(1828)    C ***************************************************************************
(1829)    C
(1830)    C  LOOP FOR PLUME-BASED OR OBSERVER-BASED CALCULATIONS OR BOTH
(1831)    C
(1832)          DO 7000 NC=NC1,NC2
(1833)          NFLAG=1
(1834)    C
(1835)    C  ALTITUDE LOOP, NZF=1 FOR PLUME CENTERLINE ONLY, NZF=2 FOR
(1836)    C  CENTERLINE AND SURFACE.
(1837)    C
(1838)          DO 7000 NZ1 = 1,NZF
(1839)          NZ=NZ1*3
(1840)          IF(NZ.EQ.3) Z=H
(1841)          IF(NZ.EQ.6) Z=0.
(1842)    C
(1843)    C  BRANCH FOR OBSERVER-SPECIFIC CALCULATION
(1844)    C
(1845)          IF(NC.EQ.2)GO TO 6100
(1846)    C
(1847)    C  INITIALIZE AND INCREMENT SCATTERING ANGLE INDEX
(1848)    C
```

Exhibit B-1 (Continued)

```
(1849)          NT=NT1-1
(1850)    6990  NT=NT+1
(1851)          ITHETA=NT+1
(1852)    C
(1853)    C   ASSIGN SCATTERING ANGLE
(1854)    C
(1855)          THETA=TT(ITHETA)
(1856)          NFLAG=-1*NFLAG
(1857)    C
(1858)    C   SKIP WRITING TITLE EVERY SECOND TIME THROUGH
(1859)    C
(1860)          IF(NFLAG.GT.0) GO TO 65
(1861)    6100  CONTINUE
(1862)          WRITE(6,10)
(1863)          WRITE(6,61)(PLANT(J),J=1,6)
(1864)    61    FORMAT (20X,41HVISUAL EFFECTS FOR HORIZONTAL SIGHT PATHS,/20X,6A4,
(1865)         1/)
(1866)    C
(1867)    C   XKM = DOWNWIND DISTANCE IN KILOMETERS
(1868)    C
(1869)          WRITE(6,52) XKM
(1870)    C
(1871)    C   H = HEIGHT OF PLUME CENTERLINE.
(1872)    C
(1873)          WRITE(6,53) H
(1874)    C
(1875)    C   BRANCH IF DOING PLUME-BASED CALCULATION
(1876)    C
(1877)          IF(NC.EQ.1)GO TO 6400
(1878)          WRITE(6,611)OBSPLU(NX)
(1879)      611 FORMAT(31H PLUME-OBSERVER DISTANCE (KM) =,F7.1)
(1880)          WRITE(6,612)AZMUTH(NX)
(1881)      612 FORMAT(27H AZIMUTH OF LINE-OF-SIGHT =,F7.1)
(1882)          WRITE(6,613)ABETA(NX)
(1883)      613 FORMAT(35H ELEVATION ANGLE OF LINE-OF-SIGHT =,F7.1)
(1884)          WRITE(6,614)ZENITH,TIME,IMO,IDAY
(1885)      614 FORMAT(21H SOLAR ZENITH ANGLE =,F7.1,2X,4H AT ,F5.0,4H ON ,
(1886)         1   I2,1H/,I2)
(1887)    C
(1888)    C   ASSIGN SCATTERING ANGLE
(1889)    C
(1890)          THETA=TT(NX+7)
(1891)    C
(1892)    C    ASSIGN INDEX FOR PHASE FUNCTIONS FOR CALL TO PLMCLN
(1893)    C
(1894)          ITHETA=7+NX
(1895)    C
(1896)    C   ASSIGN HORIZONTAL ANGLE BETWEEN OBSERVER LINE-OF-SIGHT AND PLUME
(1897)    C   CENTERLINE.
(1898)    C
(1899)          ALPHA=AALPHA(NX)
(1900)    C
(1901)    C   ASSIGN OBSERVER-PLUME DISTANCE ALONG LINE-OF-SIGHT
(1902)    C
(1903)          RP=OBSPLU(NX)
(1904)    C
```

Exhibit B-1 (Continued)

```
(1905)   C  ADJUST OPTICAL THICKNESS FOR LINE-OF-SIGHT NOT PERPENDICULAR TO PLUME
(1906)   C
(1907)         YINT=CHIQIY(NZ)/SIN(ALPHA*RAD)
(1908)    6400 CONTINUE
(1909)         IF(NZ1.EQ.1) WRITE(6,62)
(1910)         IF(NZ1.EQ.2) WRITE(6,63)
(1911)    62   FORMAT(35H SIGHT PATH IS THROUGH PLUME CENTER./)
(1912)    63   FORMAT(30H SIGHT PATH IS AT GROUND LEVEL./)
(1913)         WRITE(6,64)
(1914)    64   FORMAT(6H THETA,1X,5HALPHA,2X,6HRP/RV0,4X,2HRV,2X,8H%REDUCED,4X,
(1915)        14HYCAP,7X,1HL,7X,1HX,7X,1HY,8H DELYCAP,4X,4HDELL,2X,6HC(550),2X,
(1916)        26HBRATIO,4X,4HDELX,4X,4HDELY,2X,6HE(LUV),2X,6HE(LAB))
(1917)    65   CONTINUE
(1918)         WRITE(6,66) THETA
(1919)   C
(1920)   C  BRANCH FOR OBSERVER-BASED CALCULATION
(1921)   C
(1922)         IF(NC.EQ.2)GO TO 6500
(1923)    66   FORMAT(/,F6.0)
(1924)   C
(1925)   C  INITIALIZE AND INCREMENT INDEX FOR HORIZONTAL ANGLE BETWEEN
(1926)   C OBSERVER LINE-OF-SIGHT AND PLUME CENTERLINE (PLUME-BASED CALCULATIONS)
(1927)   C
(1928)         NA=0
(1929)    6995 NA=NA+1
(1930)         IF(NA.LT.5)GO TO 70
(1931)         ALPHA=AA(4)
(1932)         GO TO 73
(1933)   70    ALPHA=AA(NA)
(1934)   C
(1935)   C  CHI/Q AT PLUME CENTERLINE * EQUIVALENT DISTANCE TO MATCH CHI/Q
(1936)   C  INTEGAL IN Y-DIRECTION FOR GAUSSIAN DISTRIBUTION.
(1937)   C
(1938)   73    YINT=CHIQIY(NZ)/SIN(ALPHA*RAD)
(1939)         NP=0
(1940)   C
(1941)   C  INITIALIZE AND INCREMENT OBSERVER-PLUME DISTANCE INDEX
(1942)   C
(1943)    6999 NP=NP+1
(1944)   C
(1945)   C  RP = DISTANCE TO PLUME FROM OBSERVER ALONG LINE-OF-SIGHT
(1946)   C
(1947)         RP=ROBJ(NP)*RVAMB
(1948)   C
(1949)   C   SPECIAL CASE FOR NA=5 FOR OBSERVER POSITIONED AT 1/2 OF A 22.5
(1950)   C   DEGREE SECTOR FROM THE PLUME CENTERLINE. IF THIS DISTANCE IS <
(1951)   C   5 KM, IT IS SET TO 5 KM.
(1952)   C
(1953)         IF(NA.LT.5)GO TO 6500
(1954)         RP=AMAX1((DIST(NX)/1000.)*TAN(22.5/2.*RAD),5.)
(1955)    6500 CONTINUE
(1956)         PLMDIS=RP
(1957)   C
(1958)   C   CALCULATE RATIO OF PERPENDICULAR PLUME-OBSERVER DISTANCE TO SIGMA Y.
(1959)   C
(1960)         RPR= RP/SY*1000.*SIN(ALPHA*RAD)
```

Exhibit B-1 (Continued)

```
(1961)          YINTR=1.0
(1962)    C
(1963)    C   BRANCH IF OBSERVER TO PLUME DISTANCE IS GREATER THAN 2.17*SIGMA-Y
(1964)    C
(1965)          IF(RPR.GT.2.17) GO TO 6601
(1966)    C
(1967)    C   REDEFINING RP IF OBSERVER IS WITHIN THE PLUME SO THAT RP IS DISTANCE
(1968)    C   TO PLUME CENTROID.  ALSO, CALCULATE THE FRACTION OF TOTAL PLUME
(1969)    C   OPTICAL THICKNESS WITHIN LINE OF SIGHT.
(1970)    C
(1971)          RPHALF=0.18*(RPR+0.25)+0.153*(RPR+0.75)+0.167*(RPR+1.5)
(1972)          IF(RPR.GT.0.5)GO TO 6501
(1973)          YINTR1=(RPR/0.5)*0.18
(1974)          YINTR=YINTR1+0.50
(1975)          RP=((RPR*YINTR1/2.+RPHALF)/YINTR)*(SY/1000.)/SIN(ALPHA*RAD)
(1976)          GO TO 6601
(1977)    6501  IF(RPR.GT.1.0)GO TO 6502
(1978)          YINTR1=(RPR-0.5)*0.153/0.5
(1979)          YINTR=YINTR1+0.68
(1980)          RP=(((RPR-0.5)*YINTR1/2.+(RPR-0.25)*0.18+RPHALF)/YINTR)*(SY/1000.)
(1981)         1 /SIN(ALPHA*RAD)
(1982)          GO TO 6601
(1983)    6502  YINTR1=(RPR-1.0)*0.142
(1984)          YINTR=YINTR1+0.833
(1985)          RP=(((RPR-1.)*YINTR1/2.+(RPR-0.75)*0.153+(RPR-0.25)*0.18+RPHALF)
(1986)         1 /YINTR)*(SY/1000.)/SIN(ALPHA*RAD)
(1987)     6601 CONTINUE
(1988)          YINT1=YINT*YINTR
(1989)    C
(1990)    C   CALCULATION OF MASS INTEGRAL ALONG LINE-OF-SIGHT WITHIN PLUME FOR
(1991)    C   PRIMARY PARTICULATE, SULFATE, AND NO2
(1992)    C
(1993)          PLUMEP=YINT1*QPART
(1994)          PLUMES=YINT1*QSO4
(1995)          PLUMEN= YINT1*QNO2I(NZ)
(1996)    C
(1997)    C   CALCULATION OF OPTICAL THICKNESS OF PLUME DUE TO SULFATE, NO2,
(1998)    C   AND PRIMARY PARTICULATE.
(1999)    C
(2000)          TAPSO4 = BTASO4(19)*PLUMES
(2001)          TAPNO2 = ABSNO2(19)*PLUMEN
(2002)          TAUPRM = BTAPRM(19)*PLUMEP
(2003)    C
(2004)    C   CALCULATE BACKGROUND SKY INTENSITIES (SPECB) AND PLUME INTENSITIES
(2005)    C   (SPECP).    *********CALL PLMCLN*********
(2006)    C
(2007)          CALL PLMCLN(ZENITH,0.,THETA,ITHETA,PLUMEP,PLUMES,PLUMEN,SPECB,SPEC
(2008)         1P,RP,THICK)
(2009)    C
(2010)    C    CALL ROUTINE TO CALCULATE COLORATION PARAMETERS
(2011)    C
(2012)          CALL CHROMA(SPECP,SPECB)
(2013)     6608 CONTINUE
(2014)    C
(2015)    C   NEXT CALCULATE REDUCTION IN VISUAL RANGE THROUGH PLUME DUE TO AEROSOL
(2016)    C
```

Exhibit B-1 (Continued)

```
(2017)          CORN02=ALOG(CONT2+1.)
(2018)          THICK = TAPS04 + TAUPRM + TAPN02 + CORN02
(2019)          SYALPH = (SY/1000.)/SIN(ALPHA*RAD)
(2020)      C
(2021)      C   ADD IN OPTICAL DEPTH OF BACKGROUND AIR IN FRONT OF AND WITHIN
(2022)      C   PLUME.
(2023)      C
(2024)          TAUPLU = BTABAC(19)*(PLMDIS + 2.17*SYALPH) + THICK
(2025)      C
(2026)      C   BRANCH IF PLUME AEROSOL OPTICAL DEPTH = ZERO
(2027)      C
(2028)          IF(THICK.EQ.0.) GO TO 6602
(2029)      C
(2030)      C   BRANCH IF OPTICAL DEPTH OF AEROSOL IN FRONT OF PLUME AND OF PLUME
(2031)      C   AEROSOL IS NOT SUFFICIENT TO REDUCE VISUAL RANGE TO PREVENT SEEING
(2032)      C   BEYOND PLUME.
(2033)      C
(2034)          IF(TAUPLU .LT. 3.912) GO TO 6602
(2035)          TAUBAF = BTABAC(19)*PLMDIS + ((YINTR-0.5)/YINTR)*THICK
(2036)          RESIDP = 3.912 - TAUBAF
(2037)          RESIDA = RESIDP
(2038)          IF(RESIDP .LT. 0.) RESIDA = -1.*RESIDP
(2039)          DELT1 = 0.15*THICK/YINTR + 0.5*SYALPH*BTABAC(19)
(2040)          DELT2 = 0.333*THICK/YINTR + SYALPH*BTABAC(19)
(2041)          DELT3 = 0.5*THICK/YINTR + 2.17*SYALPH*BTABAC(19)
(2042)          RV = PLMDIS +((RESIDP/RESIDA)*(1. + 1.17*(RESIDA - DELT2)/
(2043)         1 (DELT3 - DELT2)))*SYALPH
(2044)          IF(RESIDA .LT. DELT2) RV = PLMDIS + (RESIDP/RESIDA)*(1. + (RESIDA-
(2045)         1 DELT1)/(DELT2 - DELT1))*0.5*SYALPH
(2046)          IF(RESIDA .LT. DELT1) RV = PLMDIS + 0.5*SYALPH*RESIDP/DELT1
(2047)          GO TO 6606
(2048)      6602 CONTINUE
(2049)      C
(2050)      C   CALCULATION OF DISTANCE OBSERVER WOULD SEE BEYOND PLUME
(2051)      C
(2052)          BKPLM = (3.912 - TAUPLU)/BTABAC(19)
(2053)      C
(2054)      C   VISUAL RANGE = DISTANCE TO PLUME + WIDTH OF PLUME + DISTANCE
(2055)      C   BEYOND PLUME.
(2056)      C
(2057)          RV = PLMDIS + 2.17*SYALPH + BKPLM
(2058)      6606 CONTINUE
(2059)      C
(2060)      C   MINIMUM VISUAL RANGE LOOKING THROUGH PLUME CENTERLINE WITH
(2061)      C   BACKGROUND EXTINCTION AND WITH PLUME SO4, NO2, AND PRIMARY
(2062)      C   PARTICULATE EXTINCTION.
(2063)      C
(2064)            RVMIN=3.912/(BTABAC(19) + BTAS04(19)*XS04C + ABSN02(19)*XN02C
(2065)         1 + BTAPRM(19)*XPRMC )
(2066)          IF(RV .LT. RVMIN) RV= RVMIN
(2067)          IF(RV.GT.RVAMB)RV=RVAMB
(2068)      C
(2069)      C   REDUCTION IN VISUAL RANGE LOOKING THROUGH THE PLUME
(2070)      C
(2071)          REDRV=100.*(1.-RV/RVAMB)
(2072)          IF(NC.EQ.1)GO TO 6670
```

Exhibit B-1 (Continued)

```
(2073)  C
(2074)  C  SAVE KEY VISUAL IMPACT PARAMETERS FOR PLOTTING LATER (OBSERVER-
(2075)  C  BASED CASE)
(2076)  C
(2077)        PLT1(NX,1)=REDRV
(2078)        PLT2(NX,1)=BRATIO
(2079)        PLT3(NX,1)=CONT2
(2080)        PLT4(NX,1)=DELAB
(2081)        GO TO 6607
(2082)  C
(2083)  C  SELECT THE PARTICULAR CASE FOR PLOTTING FOR THE PLUME-BASED
(2084)  C  CALCULATION.
(2085)  C  NP IS PLUME-OBSERVER DISTANCE INDEX, NA IS ALPHA INDEX,
(2086)  C  NT IS SCATTERING ANGLE INDEX, AND NZ IS ALTITUDE INDEX.
(2087)  C
(2088)  6610  IF(NP.NE.NPP)GO TO 6607
(2089)        IF(NA.NE.NAP)GO TO 6607
(2090)        IF(NT.NE.NTP)GO TO 6607
(2091)        IF(NZ.NE.NZP)GO TO 6607
(2092)  C
(2093)  C  SAVE THE KEY VISUAL IMPACT VALUES FOR THE DESIRED RP, THETA, ALPHA,
(2094)  C  AND NZ FOR THE PLUME-BASED  PLOTS.
(2095)  C
(2096)        PLOT1(NX,1)=REDRV
(2097)        PLOT2(NX,1)=BRATIO
(2098)        PLOT3(NX,1)=CONT2
(2099)        PLOT4(NX,1)=DELAB
(2100)   6607 CONTINUE
(2101)        IF(NC.EQ.1) GO TO 6609
(2102)  C
(2103)  C  WRITE OUT RESULTS FOR OBSERVER-BASED CASE CALCULATIONS
(2104)  C
(2105)        RPLMOB=OBSPLU(NX)/RVAMB
(2106)        WRITE(6,67)  ALPHA,RPLMOB,RV,REDRV,YCAP,VAL,X,Y,YCAPD,VALD,CONT2,
(2107)       1BRATIO,XD,YD,DELUV,DELAB
(2108)        GO TO 7000
(2109)   6609 CONTINUE
(2110)        RROBJT=ROBJ(NP)
(2111)        IF(NA.EQ.5)RROBJT=RP/RVAMB
(2112)  C
(2113)  C  WRITE OUT RESULTS FOR PLUME-BASED CASE CALCULATIONS
(2114)  C
(2115)        IF(NA.EQ.5)WRITE(6,88)
(2116)  88    FORMAT(1H0,4X,12HOBSERVER POSITION AT 1/2 OF A 22.5 DEGREE WIND D
(2117)       1IRECTION SECTOR FROM THE PLUME CENTERLINE AT THE GIVEN DISTANCE FR
(2118)       2OM THE SOURCE,/)
(2119)        WRITE(6,67)  ALPHA,RROBJT,RV,REDRV,YCAP,VAL,X,Y,YCAPD,VALD,
(2120)       1CONT2,BRATIO,XD,YD,DELUV,DELAB
(2121)  67    FORMAT(5X,F3.0,F8.2,F8.1,3F8.2,2F8.4,2F8.2,6F8.4)
(2122)  C
(2123)  C  TEST IF DISTANCE, ALPHA, AND THETA LOOPS ARE COMPLETED.
(2124)  C
(2125)        IF(NP.LT.6 .AND. NA .LT. 5)GO TO 6999
(2126)        IF(NA.LT.5)GO TO 6995
(2127)        IF(NT.LT.(NT2-1))GO TO 6990
(2128)   7000 CONTINUE
```

Exhibit B-1 (Continued)

```
(2129)   7001 CONTINUE
(2130)        CHIQIZ=(TANB/TGTE#P)/(SQRT(2.*P1)*SY*U)
(2131)        CHIQIZ=CHIQIZ/1000.
(2132)  C
(2133)  C  BRANCH AROUND NON-HORIZONTAL SIGHT PATHS CALCULATIONS IF IFLG2
(2134)  C  WAS SET TO ZERO.
(2135)  C
(2136)        IF(IFLG2.EQ.0) GO TO 8001
(2137)  C
(2138)  C ***********************************************************************
(2139)  C
(2140)  C  **** NON-HORIZONTAL SIGHT PATHS CALCULATIONS ********************
(2141)  C
(2142)  C ***********************************************************************
(2143)  C
(2144)  C LOOP ON TYPES OF CALCULATIONS (PLUME-BASED OR OBSERVER-BASED OR BOTH)
(2145)  C
(2146)        DO 8000 NC=NC1,NC2
(2147)  C
(2148)  C  IF SPECIFIC CASE BETA LESS THAN 5 DEGREES, SKIP CALCULATION.
(2149)  C
(2150)        IF(NC.EQ.2.AND.ABETA(NN).LT.5.)GO TO 8001
(2151)  C
(2152)  C  BRANCH FOR SPECIFIC CASE CALCULATION
(2153)  C
(2154)   7110 IF(NC.EQ.2)GO TO 7100
(2155)        NFLAG=1
(2156)  C
(2157)  C  INITIALIZE AND INCREMENT SCATTERING ANGLE INDEX
(2158)  C
(2159)        NT=NT1-1
(2160)   7996 NT=NT+1
(2161)        ITHETA=NT+1
(2162)  C
(2163)  C  ASSIGN SCATTERING ANGLE
(2164)  C
(2165)        THETA=TT(ITHETA)
(2166)        NFLAG=-1*NFLAG
(2167)        IF(NFLAG.GT.0) GO TO 75
(2168)   7100 CONTINUE
(2169)        WRITE(6,10)
(2170)        WRITE(6,71)(PLANT(J),J=1,6)
(2171)   71   FORMAT(20X,70HVISUAL EFFECTS FOR NON-HORIZONTAL CLEAR SKY VIEWS TH
(2172)       1ROUGH PLUME CENTER,//,20X,6A4,//)
(2173)  C
(2174)  C  XKM = DOWNWIND DISTANCE IN KM
(2175)  C  H = PLUME CENTERLINE HEIGHT
(2176)  C  BRANCH IF DOING PLUME-BASED CALCULATION
(2177)  C
(2178)        WRITE(6,52) XKM
(2179)        WRITE(6,53) H
(2180)        IF(NC.EQ.1)GO TO 7200
(2181)  C
(2182)  C  WRITE OUT DISTANCE FROM OBSERVER TO PLUME ALONG LINE-OF-SIGHT.
(2183)  C
(2184)        WRITE(6,611)OBSPLU(NN)
```

Exhibit B-3 (Continued)

```
(2185)   C
(2186)   C  WRITE OUT AZIMUTH OF OBSERVER LINE-OF-SIGHT TO PLUME
(2187)   C
(2188)          WRITE(6,612)AZMUTH(NX)
(2189)   C
(2190)   C  WRITE OUT ELEVATION ANGLE OF OBSERVER LINE-OF-SIGHT.
(2191)   C
(2192)          WRITE(6,613)ABETA(NX)
(2193)   C
(2194)   C  WRITE OUT SOLAR ZENITH ANGLE, TIME OF DAY, MONTH, DAY OF MONTH
(2195)   C
(2196)          WRITE(6,614)ZENITH,TIME,IMO,IDAY
(2197)   C
(2198)   C  ASSIGN SCATTERING ANGLE AND INDEX FOR SCATTERING PHASE FUNCTIONS.
(2199)   C
(2200)          THETA=TT(NX+7)
(2201)          ITHETA=7+NX
(2202)   C
(2203)   C  ASSIGN HORIZONTAL ANGLE BETWEEN PLUME CENTERLINE AND LINE-OF-SIGHT
(2204)   C
(2205)          ALPHA=AALPHA(NX)
(2206)   C
(2207)   C  ASSIGN ELEVATION ANGLE FOR LINE OF SIGHT TO POINT ON PLUME CENTERLINE
(2208)   C
(2209)          BETA=ABETA(NX)
(2210)   C
(2211)   C  ASSIGN DISTANCE TO PLUME CENTERLINE ALONG LINE-OF-SIGHT.
(2212)   C
(2213)          RP=OBSPLU(NX)
(2214)    7200  CONTINUE
(2215)          WRITE(6,72)
(2216)    72    FORMAT(/,6H THETA,3X,5HALPHA,4X,4HBETA,6X,2HRP,
(2217)         14X,4HYCAP,7X,1HL,7X,1HX,7X,1HY,8H DELYCAP,4X,4HDELL,2X,6HC(550),
(2218)         2 2X,6HBRATIO,4X,4HDELX,4X,4HDELY,2X,6HE(LUV),2X,6HE(LAB))
(2219)    75    CONTINUE
(2220)          WRITE(6,66) THETA
(2221)   C
(2222)   C  BRANCH FOR OBSERVER-BASED CASE CALCULATIONS.
(2223)   C
(2224)          IF(NC.EQ.2)GO TO 7300
(2225)   C
(2226)   C  INITIALIZE AND INCREMENT FOR LOOP ON ALPHA ANGLE
(2227)   C
(2228)          NA=0
(2229)    7997  NA=NA+1
(2230)          ALPHA=AA(NA)
(2231)   C
(2232)   C  INITIALIZE AND INCREMENT FOR LOOP ON OBSERVER LINE-OF-SIGHT
(2233)   C  ELEVATION ANGLE.
(2234)   C
(2235)            NB=0
(2236)    7999  NB=NB+1
(2237)          BETA=15.*FLOAT(NB)
(2238)   C
(2239)   C  CALCULATION OF OBSERVER LINE-OF-SIGHT TO PLUME DISTANCE.
(2240)   C
```

Exhibit B-1 (Continued)

```
(2241)          DELZ=H*1.E-3
(2242)          DELXY=DELZ*COS(BETA*RAD)/SIN(BETA*RAD)
(2243)          DELX=DELXY*COS(ALPHA*RAD)
(2244)          DELY=DELXY*SIN(ALPHA*RAD)
(2245)          RP=SQRT(DELZ*DELZ+DELY*DELY+DELX*DELX)
(2246)    7300 CONTINUE
(2247)          CY=CHIQIY(3)*COS(BETA*RAD)
(2248)          CZ=CHIQIY(3)*SIN(BETA*RAD)
(2249)          YZINT=SQRT(CY*CY+CZ*CZ)/SIN(ALPHA*RAD)
(2250)          PLUMEP=YZINT*QPART
(2251)          PLUMES=YZINT*(QSO4+QNO3)
(2252)          PLUMEN=YZINT*QNO2I(3)
(2253)    C
(2254)    C   CALL ROUTINE TO CALCULATE SKY INTENSITIES FOR PLUME AND SKY
(2255)    C   WITHOUT PLUME.
(2256)    C
(2257)          CALL PLMCLN(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,PLUMEN,SPECB,
(2258)         1 SPECP,RP,THICK)
(2259)    C
(2260)    C   CALL ROUTINE TO CALCULATE COLORATION PARAMETERS.
(2261)    C
(2262)          CALL CHROMA(SPECP,SPECB)
(2263)          WRITE(6,78) ALPHA,BETA,RP,YCAP,VAL,X,Y,YCAPD,VALD,CONT2,
(2264)         1BRATIO,XD,YD,DELUV,DELAB
(2265)     78   FORMAT(5X,2F8.6,3F8.2,2F8.4,2F8.2,6F8.4)
(2266)    C
(2267)    C   CHECK IF END OF LOOPS FOR PLUME-BASED CALCULATION.
(2268)    C
(2269)          IF(NC.EQ.2)GO TO 8000
(2270)          IF(NB.LT.6)GO TO 7999
(2271)          IF(NA.LT.4)GO TO 7997
(2272)          IF(NT.LT.(NT2-1))GO TO 7996
(2273)    8000 CONTINUE
(2274)    8001 CONTINUE
(2275)          IF(IFLG3.EQ.0) GO TO 9001
(2276)    C
(2277)    C ***************************************************************************
(2278)    C
(2279)    C  ***** WHITE, GRAY, AND BLACK OBJECT VIEWS ***********************
(2280)    C
(2281)    C ***************************************************************************
(2282)    C
(2283)    C  OPTICAL EFFECTS ON VIEW OF OBJECT BEHIND PLUME.
(2284)    C  CALCULATION OF PLUME PARTICULATE, SULFATE, AND NO2 INTEGRAL
(2285)    C  ACROSS PLUME.
(2286)    C
(2287)          PLUMEP=CHIQIY(3)*QPART
(2288)          PLUMES=CHIQIY(3)*(QSO4+QNO3)
(2289)          PLUMEN=CHIQIY(3)*QNO2I(3)
(2290)    C
(2291)    C  LOOP FOR PLUME-BASED, OBSERVER-BASED, OR BOTH TYPES OF CALCULATIONS
(2292)    C
(2293)          DO 9000 NC=NC1,NC2
(2294)    C
(2295)    C  BRANCH IF DOING THE PLUME-BASED CALCULATION
(2296)    C
```

Exhibit B-1 (Continued)

```
(2297)           IF(NC.EQ.1) GO TO 8002
(2298)     C
(2299)     C  ADJUST FOR OBSERVER-BASED ALPHA FOR SPECIFIC POINT
(2300)     C
(2301)           F3=SIN(AALPHA(NX)*RAD)
(2302)           PLUMEP=PLUMEP/F3
(2303)           PLUMES=PLUMES/F3
(2304)           PLUMEN=PLUMEN/F3
(2305)      8002 CONTINUE
(2306)     C
(2307)     C  BRANCH IF DOING THE OBSERVER-BASED CALCULATION.
(2308)     C
(2309)           IF(NC.EQ.2)GO TO 8100
(2310)     C
(2311)     C  INITIALIZE AND INCREMENT SCATTERING ANGLE INDEX FOR PLUME-BASED
(2312)     C  CASE CALCULATION.
(2313)     C
(2314)           NT=NT1-1
(2315)      8995 NT=NT+1
(2316)           ITHETA=NT+1
(2317)           THETA=TT(ITHETA)
(2318)      8100 CONTINUE
(2319)           WRITE(6,10)
(2320)           IF(NC.EQ.1)WRITE(6,81)(PLANT(J),J=1,6)
(2321)           IF(NC.EQ.2)WRITE(6,87)(PLANT(J),J=1,6)
(2322)      81   FORMAT(10X,41HPLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS,/,10X,
(2323)          160HPERPENDICULAR TO THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS,/,
(2324)          210X,56HFOR VARIOUS OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES,
(2325)          3//10X,6A4,//)
(2326)      87   FORMAT(10X,41HPLUME VISUAL EFFECTS FOR HORIZONTAL VIEWS,/,10X,
(2327)          146HOF THE PLUME OF WHITE, GRAY, AND BLACK OBJECTS,/,
(2328)          210X,57HFOR SPECIFIC OBSERVER-PLUME AND OBSERVER-OBJECT DISTANCES,
(2329)          3//10X,6A4,//)
(2330)           WRITE(6,52) XKM
(2331)     C
(2332)     C  BRANCH IF DOING PLUME-BASED CALCULATION
(2333)     C
(2334)           IF(NC.EQ.1)GO TO 84
(2335)           WRITE(6,611)OBSPLU(NX)
(2336)           WRITE(6,612)AZMUTH(NX)
(2337)           WRITE(6,613)ABETA(NX)
(2338)           WRITE(6,614)ZENITH,TIME,IMO,IDAY
(2339)     C
(2340)     C  ASSIGN SPECIFIC SCATTERING ANGLE AND INDEX FOR SCATTERING ANGLE PHASE
(2341)     C   FUNCTIONS.
(2342)     C
(2343)           THETA=TT(NX+7)
(2344)           ITHETA=7+NX
(2345)        84 WRITE(6,82)THETA
(2346)      82   FORMAT(9H THETA = ,F5.0)
(2347)           WRITE(6,83)
(2348)      83   FORMAT(/,1X,7HREFLECT,2X,6HRP/RV0,2X,6HRO/RV0,4X,4HYCAP,7X,1HL,7X,
(2349)          11HX,7X,1HY,3H DELYCAP,4X,4HDELL,2X,6HC(550),2X,6HRATIO,4X,4HDELX,
(2350)          24X,4HDELY,2X,6HE(LUV),2X,6HE(LAB),/)
(2351)     C
(2352)     C  LOOP ON REFLECTIVITY OF OBJECT (K=1 FOR WHITE, K=2 FOR GRAY, K=3 FOR
```

Exhibit B-1 (Continued)

```
(2353)   C  BLACK)
(2354)   C
(2355)         DO 8999 K=1,3
(2356)         XLUMIN=REFL(K)/(2.*PI)
(2357)   C
(2358)   C  BRANCH IF OBSERVER-BASED CASE
(2359)   C
(2360)         IF(NC.EQ.2)GO TO 86
(2361)   C
(2362)   C  INITIALIZE AND INCREMENT INDEX FOR OBSERVER TO PLUME DISTANCE
(2363)   C  ALONG LINE-OF-SIGHT.
(2364)   C
(2365)         IP=0
(2366)    8996 IP=IP+1
(2367)         NRO=7-IP
(2368)   C
(2369)   C  INITIALIZE AND INCREMENT INDEX FOR DISTANCE FROM OBSERVER TO
(2370)   C  BACKGROUND OBJECT ALONG LINE-OF-SIGHT.
(2371)   C
(2372)         IO1=0
(2373)    8997 IO1=IO1+1
(2374)         RP=ROBJ(IP)*RVAMB
(2375)         IPIO1=IP+IO1-1
(2376)         RO=ROBJ(IPIO1)*RVAMB
(2377)         RPR=(RP/SY)*1000.
(2378)         ROR=((RO-RP)/SY)*1000.
(2379)         IF(RPR.GT.2.17.AND.ROR.GT.2.17)GO TO 8991
(2380)   C
(2381)   C    IF OBSERVER OR OBJECT BACKGROUND IS WITHIN THE PLUME, CHANGE THE
(2382)   C    OBSERVER-TO-PLUME DISTANCE TO BE THE DISTANCE TO THE CENTROID OF
(2383)   C    THE AREA UNDER THE GAUSSIAN CURVE FOR THE PLUME BETWEEN THE
(2384)   C    OBSERVER AND THE BACKGROUND OBJECT.
(2385)   C
(2386)         CALL PLMIN(RPR,ROR,SY,RP,YINTR)
(2387)         PLUMP1=PLUMEP*YINTR
(2388)         PLUMS1=PLUMES*YINTR
(2389)         PLUMN1=PLUMEN*YINTR
(2390)   C
(2391)   C  CALL ROUTINE TO CALCULATE INTENSITIES FOR OBJECT W/O PLUME
(2392)   C  (SPECO) AND WITH PLUME (SPECP).
(2393)   C
(2394)         CALL PLMOBJ(ZENITH,BETA,THETA,ITHETA,PLUMP1,PLUMS1,PLUMN1,XLUMIN,
(2395)        1RO,RP,SPECO,SPECP)
(2396)         GO TO 89
(2397)   8991  CALL PLMOBJ(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,PLUMEN,XLUMIN,
(2398)        1RO,RP,SPECO,SPECP)
(2399)   C
(2400)   C  CALL ROUTINE TO CALCULATE COLORATION PARAMETERS.
(2401)   C
(2402)   89     CALL CHROMA(SPECP,SPECO)
(2403)         IPIO1=IP+IO1-1
(2404)         WRITE(6,85) REFL(K),ROBJ(IP),ROBJ(IPIO1),YCAP,VAL,X,Y,YCAPD,
(2405)        1VALD,CONT2,BRATIO,XD,YD,DELUV,DELAB
(2406)    85   FORMAT(F8.1,4F8.2,2F8.4,2F8.2,6F8.4)
(2407)   C
(2408)   C  SPECIFY OBJECT DISTANCE, PLUME-OBSERVER DISTANCE, AND SCATTERING ANGLE
```

Exhibit B-1 (Continued)

```
(2409)  C  FOR SAVING RESULTS TO BE PLOTTED.
(2410)  C
(2411)        IF(IO1.NE.IO1P)GO TO 8990
(2412)        IF(IP.NE.IPP)GO TO 8990
(2413)        IF(NT.NE.NTP)GO TO 8990
(2414)  C
(2415)  C  VISUAL RANGE REDUCTION IS DEFINED FOR CLEAR SKY ONLY.
(2416)  C
(2417)        PLOT1(NX,K+1)=0.
(2418)        PLOT2(NX,K+1)=BRATIO
(2419)        PLOT3(NX,K+1)=CONT2
(2420)        PLOT4(NX,K+1)=DELAB
(2421)  C
(2422)  C  CHECK IF END OF LOOP ON BACKGROUND OBJECT DISTANCE INDEX.
(2423)  C
(2424)  8990  IF(IO1.LT.NRO)GO TO 8997
(2425)  C
(2426)  C  CHECK IF END OF LOOP ON OBSERVER-PLUME DISTANCE INDEX.
(2427)  C
(2428)        IF(IP.LT.6)GO TO 8996
(2429)         GO TO 8999
(2430)  C
(2431)  C  CONTINUE WITH OBSERVER-BASED CALCULATION.  ASSIGN SCATTERING ANGLE.
(2432)  C
(2433)     86 ITHETA=7+NX
(2434)        THETA=TT(ITHETA)
(2435)        RP=OBSPLU(NX)
(2436)  C
(2437)  C  JUMP OUT OF CALCULATION IF OBJECT IS BETWEEN CENTER
(2438)  C  OF PLUME AND OBSERVER.
(2439)  C
(2440)        IF(OBSPLU(NX).GT.ROBJT(NX))WRITE(6,90)
(2441)  90    FORMAT(10X,85HBACKGROUND OBJECT IS BETWEEN OBSERVER AND CENTER OF
(2442)       1PLUME AND CALCULATION IS STOPPED.)
(2443)        IF(OBSPLU(NX).GT.ROBJT(NX))GO TO 9000
(2444)        RPR=(RP/SY)*1000.
(2445)        ROR=((ROBJT(NX)-RP)/SY)*1000.
(2446)        IF(RPR.GT.2.17.AND.ROR.GT.2.17)GO TO 8992
(2447)  C
(2448)  C   IF OBSERVER OR OBJECT IS WITHIN THE PLUME, CHANGE THE OBSERVER-TO-
(2449)  C   PLUME DISTANCE TO BE THE DISTANCE TO THE CENTROID OF THE AREA UNDER
(2450)  C   THE GAUSSIAN CURVE FOR THE PLUME BETWEEN THE OBSERVER AND THE BACK-
(2451)  C   GROUND OBJECT.
(2452)  C
(2453)        CALL PLMIN(RPR,ROR,SY,RP,YINTR)
(2454)  C
(2455)  C   CORRECT FOR VIEWS NOT PERPENDICULAR TO THE PLUME CENTERLINE
(2456)  C
(2457)        RP=RP/SIN(AALPHA(NX)*RAD)
(2458)        PLUMP1=PLUMEP*YINTR
(2459)        PLUMS1=PLUMES*YINTR
(2460)        PLUMN1=PLUMEN*YINTR
(2461)  C
(2462)  C  CALL ROUTINE TO CALCULATE INTENSITIES WITH AND WITHOUT PLUME.
(2463)  C
(2464)        CALL PLMOBJ(ZENITH,ABETA(NX),THETA,ITHETA,PLUMP1,PLUMS1,
```

Exhibit B-1 (Continued)

```
(2465)          1 PLUMN1,XLUMIN,ROBJT(NX),RP,SPECO,SPECP)
(2466)            GO TO 91
(2467)    8992  CALL PLMOBJ(ZENITH,ABETA(NX) ,THETA,ITHETA,PLUMEP,PLUMES,
(2468)          1 PLUMEN,XLUMIN,ROBJT(NX),RP,SPECO,SPECP)
(2469)    C
(2470)    C  CALL ROUTINE TO CALCULATE COLORATION PARAMETERS.
(2471)    C
(2472)    91    CALL CHROMA(SPECP,SPECO)
(2473)    C
(2474)    C  SAVE RESULTS FOR PLOTTING.
(2475)    C
(2476)          PLT1(NX,K+1)=0.
(2477)          PLT2(NX,K+1)=BRATIO
(2478)           PLT3(NX,K+1)=CONT2
(2479)          PLT4(NX,K+1)=DELAB
(2480)     8998 CONTINUE
(2481)          RPLMOB=OBSPLU(NX)/RVAMB
(2482)          RROBJT=ROBJT(NX)/RVAMB
(2483)          WRITE(6,85)REFL(K),RPLMOB,RROBJT,YCAP,VAL,X,Y,YCAPD,VALD,
(2484)         1 CONT2,BRATIO,XD,YD,DELUV,DELAB
(2485)     8999 CONTINUE
(2486)    C
(2487)    C  CHECK IF LOOP ON SCATTERING ANGLE FOR PLUME-BASED CASE IS COMPLETED
(2488)    C
(2489)          IF(NC.EQ.1.AND.NT.LT.(NT2-1))GO TO 8995
(2490)     9000 CONTINUE
(2491)     9001 CONTINUE
(2492)    C
(2493)    C  SKIP VISUAL EFFECTS ALONG PLUME IF IFLG4=0
(2494)    C
(2495)          IF(IFLG4.EQ.0)GO TO 1301
(2496)    C
(2497)    C ***************************************************************************
(2498)    C
(2499)    C** VISUAL EFFECTS ALONG PLUME ********************************************
(2500)    C
(2501)    C ***************************************************************************
(2502)    C
(2503)    C LOOP ON TYPE OF CALCULATION: PLUME-BASED, OBSERVER-BASED, OR BOTH.
(2504)    C
(2505)          DO 1300 NC=NC1,NC2
(2506)    C
(2507)    C  LOOP FOR CALC AT PLUME CL AND AT GROUND.
(2508)    C
(2509)          DO 1300 NZ1=1,NZF
(2510)          NZ=NZ1*3
(2511)          IF(NZ.EQ.3)Z=H
(2512)          IF(NZ.EQ.6)Z=0.
(2513)    C
(2514)    C  BRANCH IF DOING OBSERVER-BASED CALCULATION.
(2515)    C
(2516)          IF(NC.EQ.2)GO TO 1002
(2517)    C
(2518)    C  INITIALIZE AND INCREMENT LOOP FOR SCATTERING ANGLE
(2519)    C
(2520)          NT=NT1-1
```

Exhibit B-1 (Continued)

```
(2521)   1001  NT=NT+1
(2522)         ITHETA=NT+1
(2523)         THETA=TT(ITHETA)
(2524)   1002  CONTINUE
(2525)         WRITE(6,10)
(2526)         WRITE(6,1010)(PLANT(J),J=1,6)
(2527)   1010  FORMAT(10X,45HVISUAL EFFECTS FOR LINES OF SIGHT ALONG PLUME//,10X,
(2528)        1 6A4//)
(2529)         WRITE(6,52)XKM
(2530)   C
(2531)   C  BRANCH FOR PLUME-BASED CALCULATION.
(2532)   C
(2533)         IF(NC.EQ.1)GO TO 1005
(2534)         WRITE(6,611)OBSPLU(NX)
(2535)         WRITE(6,612)AZMUTH(NX)
(2536)         WRITE(6,613)ABETA(NX)
(2537)         WRITE(6,614)ZENITH,TIME,IMO,IDAY
(2538)   C
(2539)   C  ASSIGN PLUME-BASED CASE SCATTERING ANGLE AND SCATTERING PHASE FUNCTION
(2540)   C  INDEX.
(2541)   C
(2542)         THETA=TT(NX+7)
(2543)         ITHETA=7+NX
(2544)   1005  CONTINUE
(2545)         WRITE(6,1020)
(2546)   1020  FORMAT(6H THETA,1X,6HLENGTH,1X,6HRP/RV0,4X,2HRV,2X,8H%REDUCED,4X,
(2547)        1 4HYCAP,7X,1HL,7X,1HX,7X,1HY,8H DELYCAP,4X,4HDELL,2X,6HC(550),2X,
(2548)        2 6HBRATIO,4X,4HDELX,4X,4HDELY,2X,6HE(LUV),2X,6HE(LAB))
(2549)   1021  CONTINUE
(2550)         WRITE(6,66)THETA
(2551)   C
(2552)   C  BRANCH IF DOING PLUME-BASED CASE CALCULATION
(2553)   C
(2554)         IF(NC.EQ.1)GO TO 1008
(2555)   C
(2556)   C  OBLIQUE ANGLE CALCULATIONS FOR SPECIFIC CASE
(2557)   C  CONCENTRATIONS FOR PRIMARY PARTICULATE, SO4, AND NO2
(2558)   C
(2559)         CPAVE=XPARTP(NX,NZ)
(2560)         CSAVE=XPARTS(NX,NZ)
(2561)         CNAVE=XNO2I(NX,NZ)
(2562)   C
(2563)   C  DISTANCE WITHIN PLUME
(2564)   C
(2565)          XALONG =((SY/1000.)*SQRT(PI*2.))/(SIN(AALPHA(NX)*RAD))
(2566)         XLONG2=XALONG/2.
(2567)   C
(2568)   C  CHECK IF OBSERVER IN PLUME, IF YES , MODIFY XALONG
(2569)   C
(2570)         IF(OBSPLU(NX).LT.XLONG2)XALONG=OBSPLU(NX)+XLONG2
(2571)   C
(2572)   C  CALCULATIONS FOR CLEAR SKY AND THREE BACKGROUND REFLECTANCES.
(2573)   C
(2574)         ALONG=OBSPLU(NX)-XLONG2
(2575)         IF(ALONG.LT.0.0)ALONG=0.0
(2576)         DO 1009 K=1,4
```

Exhibit B-1 (Continued)

```
(2577)   C
(2578)   C  K=1 FOR CLEAR SKY, K=2 FOR WHITE OBJECTS, K=3 FOR GRAY OBJECTS,
(2579)   C  K=4 FOR BLACK OBJECTS.
(2580)   C  BRANCH IF K > 1
(2581)   C
(2582)          IF(K.GT.1)GO TO 1025
(2583)   C
(2584)   C  BACKGROUND CLEAR SKY CASE
(2585)   C  CALL ROUTINE TO DEFINE BACKGROUND SKY INTENSITY WITHOUT PLUME
(2586)   C
(2587)          CALL BACCLN(ZENITH,0.,THETA,ITHETA,SPECB)
(2588)          GO TO 1026
(2589)   1025   CONTINUE
(2590)   C
(2591)   C  CALCULATION FOR BACKGROUND OBJECT.
(2592)   C
(2593)   C  DISTANCE CALULATIONS ARE THE SAME FOR K = 2, 3, 4.
(2594)   C
(2595)          IF(ROBJT(NX).LE.0.0)GO TO 1009
(2596)          XLUMIN=REFL(K-1)/(2.*PI)
(2597)   C
(2598)   C  DISTANCE CALCULATIONS DONE ONCE FOR K=2 / SKIP AROUND FOR K =3,4
(2599)   C
(2600)          IF(K.GT.2)GO TO 95
(2601)   C
(2602)   C  DISTANCE FROM OBJECT TO BACK SIDE OF PLUME
(2603)   C
(2604)          RO=ROBJT(NX)-(OBSPLU(NX)+XLONG2)
(2605)   C
(2606)   C   RESET RO IF OBJECT IS WITHIN BACK SIDE OF PLUME
(2607)   C
(2608)          IF((ROBJT(NX)-OBSPLU(NX)).LT.XLONG2)RO=0.
(2609)   C
(2610)   C  XALONG IS THE DISTANCE THAT THE LINE OF SIGHT IS WITHIN PLUME.
(2611)   C   RECALCULATE  XALONG IF OBJECT IS WITHIN BACK SIDE OF PLUME AND
(2612)   C   OBSERVER IS OUTSIDE PLUME.
(2613)   C
(2614)          IF((ROBJT(NX)-OBSPLU(NX)).LT.XLONG2)XALONG=XLONG2+(ROBJT(NX)-
(2615)         1 OBSPLU(NX))
(2616)   C
(2617)   C  ADJUSTMENT IF BOTH OBJECT AND OBSERVER ARE IN FRONT OF PLUME.
(2618)   C
(2619)          IF(OBSPLU(NX).LT.XLONG2)GO TO 97
(2620)          IF(ROBJT(NX).LT.(OBSPLU(NX)-XLONG2))GO TO 96
(2621)          GO TO 97
(2622)   96     XALONG=0.
(2623)          RO=0.
(2624)          ALONG=ROBJT(NX)
(2625)   97     CONTINUE
(2626)   C
(2627)   C  ADJUSTMENT IF BOTH OBSERVER AND BACKGROUND OBJECT ARE WITHIN FRONT
(2628)   C  SIDE OF PLUME
(2629)   C
(2630)          IF(ROBJT(NX).GT.OBSPLU(NX))GO TO 98
(2631)          IF(OBSPLU(NX).GT.XLONG2)GO TO 98
(2632)          XALONG=ROBJT(NX)
```

Exhibit B-1 (Continued)

```
(2633)          ALONG=0.
(2634)          RO=0.
(2635)    98    CONTINUE
(2636)    C
(2637)    C     ADJUSTMENT IF OBSERVER IS OUTSIDE PLUME AND BACKGROUND OBJECT IS
(2638)    C     WITHIN FRONT SIDE OF PLUME.
(2639)    C
(2640)          IF(ROBJT(NX).GT.OBSPLU(NX))GO TO 104
(2641)          IF(ROBJT(NX).LT.(OBSPLU(NX)-XLONG2))GO TO 104
(2642)          IF((OBSPLU(NX)-XLONG2).LE.0.)GO TO 104
(2643)          RO=0.
(2644)          XALONG=ROBJT(NX)-(OBSPLU(NX)-XLONG2)
(2645)          ALONG=OBSPLU(NX)-XLONG2
(2646)    104   CONTINUE
(2647)    C
(2648)    C   ADJUSTMENT FOR OBSERVER WITHIN FRONT SIDE OF PLUME AND OBJECT
(2649)    C   BEHIND PLUME.
(2650)    C
(2651)          IF(OBSPLU(NX).GT.XLONG2)GO TO 102
(2652)          IF(ROBJT(NX).LT.(OBSPLU(NX)+XLONG2))GO TO 102
(2653)          XALONG=XLONG2+OBSPLU(NX)
(2654)          RO=ROBJT(NX)-(OBSPLU(NX)+XLONG2)
(2655)          ALONG=0.
(2656)    102   CONTINUE
(2657)    C
(2658)    C   ADJUSTMENT FOR OBSERVER WITHIN FRONT SIDE OF PLUME AND OBJECT
(2659)    C   WITHIN BACK SIDE OF PLUME.
(2660)    C
(2661)          IF(OBSPLU(NX).GT.XLONG2)GO TO 103
(2662)          IF(ROBJT(NX).LT.OBSPLU(NX))GO TO 103
(2663)          IF(ROBJT(NX).GT.(OBSPLU(NX)+XLONG2))GO TO 103
(2664)          RO=0.
(2665)          ALONG=0.
(2666)          XALONG=ROBJT(NX)
(2667)    103   CONTINUE
(2668)    95    CONTINUE
(2669)    C
(2670)    C   CALL ROUTINE TO CALCULATE INTENSITY FOR BACKGROUND OBJECT
(2671)    C   AT BACK SIDE OF PLUME.
(2672)    C
(2673)          CALL BACOBJ(ZENITH,0.,THETA,ITHETA,RO,SPECB,XLUMIN)
(2674)    1026  CONTINUE
(2675)    C
(2676)    C   STORE BACKGROUND INTENSITIES AT BACK SIDE OF PLUME IN SPECP ARRAY.
(2677)    C
(2678)          DO 1027 I=1,39
(2679)          SPECP(I)=SPECB(I)
(2680)    1027  CONTINUE
(2681)    C
(2682)    C     INTENSITY FOR PLUME SEGMENT(LINE OF SIGHT FOR SPECIFIC CASE, NOT
(2683)    C     NECESSARILY ON PLUME CENTERLINE.
(2684)    C
(2685)          CALL PLMAX(ZENITH,THETA,ITHETA,CPAVE,CSAVE,CNAVE,XALONG,SPECP,
(2686)         1 SPECB)
(2687)    C
(2688)    C   INTENSITY CHANGE FOR BACKGROUND AIR BETWEEN PLUME AND OBSERVER
```

Exhibit B-1 (Continued)

```
(2689)   C
(2690)         CALL PLMAX(ZENITH,THETA,ITHETA,0.,0.,0.,ALONG,SPECP,SPECB)
(2691)   C
(2692)   C  CALL ROUTINE TO CALCULATE COLORATION PARAMETERS
(2693)   C
(2694)         CALL CHROMA(SPECP,SPECB)
(2695)   C
(2696)   C  OPTICAL DEPTH BETWEEN OBSERVER AND PLUME
(2697)   C
(2698)         TAUTOT=BTABAC(19)*ALONG
(2699)         TAU1=TAUTOT
(2700)   C
(2701)   C  OPTICAL DEPTH DUE TO PLUME PRIMARY PARTICULATE AND SO4
(2702)   C
(2703)         TAUTOT=TAUTOT+XALONG*(CPAVE*BTAPRM(19)+CSAVE*BTASO4(19)+
(2704)        1 BTABAC(19)+CNAVE*ABSNO2(19))+ALOG(CONT2+1.)
(2705)   C
(2706)   C  CHECK IF OPTICAL DEPTH .GT. VISUAL RANGE LIMIT
(2707)   C
(2708)         IF(TAUTOT.GT.3.912)GO TO 1006
(2709)   C
(2710)   C  REDUCTION IN VISUAL RANGE
(2711)   C
(2712)         DELRV=(3.912-TAUTOT)/BTABAC(19)
(2713)         RV=XALONG+ALONG+DELRV
(2714)         GO TO 1007
(2715)   1006  DELRV=(3.912-TAU)/(TAUTOT-TAU1)
(2716)         RV=ALONG+DELRV
(2717)   1007  REDRV=((RVAMB-RV)/RVAMB)*100.
(2718)         RR=OBSPLU(NX)/RVAMB
(2719)         IF(K.EQ.1)WRITE(6,47)
(2720)   47    FORMAT(5X,19HFOR SKY BACKGROUND:)
(2721)         IF(K.EQ.2)WRITE(6,74)
(2722)   74    FORMAT(5X,21HFOR WHITE BACKGROUND:)
(2723)         IF(K.EQ.3)WRITE(6,76)
(2724)   76    FORMAT(5X,20HFOR GRAY BACKGROUND:)
(2725)         IF(K.EQ.4)WRITE(6,77)
(2726)   77    FORMAT(5X,21HFOR BLACK BACKGROUND:)
(2727)         WRITE(6,67)XALONG,RR,RV,REDRV,YCAP,VAL,X,Y,YCAPD,VALD,CONT2,
(2728)        1 BRATIO,XD,YD,DELUV,DELAB
(2729)   1009  CONTINUE
(2730)   C
(2731)   C END OF CALCULATIONS FOR NC=2
(2732)   C
(2733)         GO TO 1300
(2734)   1008  CONTINUE
(2735)   C
(2736)   C  PLUME-BASED CALCULATIONS FOR PLUME CENTERLINE.
(2737)         NXEND=NX-1
(2738)   C  IF NX=1, SKIP OVER CALCULATION
(2739)   C
(2740)         IF(NXEND.EQ.0)GO TO 1300
(2741)   C
(2742)   C  LOOP ON NUMBER OF PLUME SEGMENTS
(2743)   C  LOOP ON PLUME SIGMENTS THAT CAN BE IN OBSERVER'S LINE-OF-SIGHT
(2744)   C
```

Exhibit B-1 (Continued)

```
(2745)          DO 1200 NXIN=1,NXEND
(2746)          NXX1=NX-NXIN
(2747)    C
(2748)    C   CALL ROUTINE TO CALCULATE INTENSITIES FOR BACKGROUND SKY
(2749)    C   WITHOUT PLUME.
(2750)    C
(2751)          CALL BACCLN(ZENITH,0.,THETA,ITHETA,SPECB)
(2752)          DO 1022 I=1,39
(2753)    1022  SPECP(I)=SPECB(I)
(2754)    C
(2755)    C   LOOP ON PLUME SEGMENTS BETWEEN DISTANCE NX AND FIRST POINT.
(2756)    C
(2757)          DO 1100 NXX=NXX1,NXEND
(2758)    C
(2759)    C   USE MEANS OF END POINTS OF SEGMENTS TO DEFINE CONCENTRATIONS
(2760)    C
(2761)          CPAVE=(XPARTP(NXX,NZ)+XPARTP(NXX+1,NZ))/2.
(2762)          CSAVE=(XPARTS(NXX,NZ)+XPARTS(NXX+1,NZ))/2.
(2763)          CNAVE=(XNO2I(NXX,NZ)+XNO2I(NXX+1,NZ))/2.
(2764)    C
(2765)    C   DISTANCE WITHIN PLUME IN KILOMETERS.
(2766)    C
(2767)          XALONG=(DIST(NXX+1)-DIST(NXX))/1000.
(2768)    C
(2769)    C   CHANGE INTENSITY FOR EACH SEGMENT OF PLUME (1 POINT TO THE NEXT).
(2770)    C
(2771)          CALL PLMAX(ZENITH,THETA,ITHETA,CPAVE,CSAVE,CNAVE,XALONG,SPECP,
(2772)         1 SPECB)
(2773)    1100  CONTINUE
(2774)    C
(2775)    C   NESTED LOOP FOR VARIOUS OBSERVER-TO-PLUME-SEGMENT DISTANCES.
(2776)    C
(2777)          DO 1200 NROBJ=1,7
(2778)          NR1=NROBJ-1
(2779)          XALONG=0.
(2780)    C
(2781)    C   ROBJ NOT DEFINED FOR INDEX .LT. 1, THEREFORE NO INPUT BY AIRLIGHT
(2782)    C   BETWEEN PLUME AND OBSERVER.
(2783)    C
(2784)          IF(NROBJ.EQ.1)GO TO 1115
(2785)          IF(NROBJ.EQ.2)GO TO 1111
(2786)          GO TO 1112
(2787)    C
(2788)    C   DISTANCE OF LINE-OF-SIGHT FROM OBSERVER TO PLUME SEGMENT.
(2789)    C
(2790)    1111  XALONG=ROBJ(NR1)*RVAMB
(2791)          GO TO 1110
(2792)    1112  CONTINUE
(2793)          XALONG=(ROBJ(NR1)-ROBJ(NR1-1))*RVAMB
(2794)    1110  CALL PLMAX(ZENITH,THETA,ITHETA,0.,0.,0.,XALONG,SPECP,SPECB)
(2795)    1115  CONTINUE
(2796)    C
(2797)    C   CALCULATE COLORATION PARAMETERS
(2798)    C
(2799)          CALL CHROMA(SPECP,SPECB)
(2800)          IF(NROBJ.EQ.1)GO TO 1116
```

Exhibit B-1 (Continued)

```
(2801)          GO TO 1117
(2802)    1116  TAUTOT=0.
(2803)          GO TO 1118
(2804)    1117  CONTINUE
(2805)    C
(2806)    C  OPTICAL DEPTH DUE TO AMBIENT BACKGROUND AIR
(2807)    C
(2808)          TAUTOT=BTABAC(19)*RVAMB*ROBJ(NR1)
(2809)    1118  NXX=0
(2810)    C
(2811)    C  NESTED LOOP ON DISTANCE WITHIN PLUME TO DETERMINE VISUAL RANGE.
(2812)    C
(2813)    1120  NXX=NXX+1
(2814)          TAUT1=TAUTOT
(2815)    C
(2816)    C  DISTANCE WITHIN PLUME SEGMENT
(2817)    C
(2818)          NXDIFF=NX-NXX
(2819)          XALONG=(DIST(NXDIFF+1)-DIST(NXDIFF))/1000.
(2820)    C
(2821)    C  ADD OPTICAL DEPTH FOR PRIMARY PARTICULATE
(2822)    C
(2823)          TAUTOT=TAUTOT+XALONG*BTAPRM(19)*(XPARTP(NXDIFF+1,NZ)+XPARTP(NXDI
(2824)         1FF,NZ))/2.
(2825)    C
(2826)    C  ADD OPTICAL DEPTH FOR SO4
(2827)    C
(2828)          TAUTOT=TAUTOT+XALONG*BTASO4(19)*(XPARTS(NXDIFF+1,NZ)+XPARTS(NXDI
(2829)         1FF,NZ))/2.
(2830)    C
(2831)    C  ADD OPTICAL DEPTH FOR NO2 ABSORPTION.
(2832)    C
(2833)          TAUTOT=TAUTOT+XALONG*ABSNO2(19)*(XNO2I(NXDIFF+1,NZ)+XNO2I(NXDIFF,
(2834)         1NZ))/2.+ALOG(CONT2+1.)
(2835)    C
(2836)    C  ADD OPTICAL DEPTH FOR BACKGROUND AIR IN PLUME
(2837)    C
(2838)          TAUTOT=TAUTOT+XALONG*BTABAC(19)
(2839)    C
(2840)    C  STOP CALCULATION IF VISUAL RANGE EXCEEDED
(2841)    C
(2842)          IF(TAUTOT.GT.3.912)GO TO 1160
(2843)          IF(NXX.LT.NXIN)GO TO 1120
(2844)    C
(2845)    C   DETERMINE DISTANCE FROM BACKSIDE OF PLUME TO VISUAL RANGE LIMIT
(2846)    C
(2847)          DELRV=(3.912-TAUTOT)/BTABAC(19)
(2848)    C
(2849)    C  CALCULATE VISUAL RANGE
(2850)    C
(2851)          IF(NROBJ.GT.1)GO TO 1130
(2852)          RV=(DIST(NX)-DIST(NXX1))/1000.+DELRV
(2853)          GO TO 1170
(2854)    1130  CONTINUE
(2855)          RV=ROBJ(NR1)*RVAMB+(DIST(NX)-DIST(NXX1))/1000.+DELRV
(2856)          GO TO 1170
```

Exhibit B-1 (Continued)

```
(2857)   1160  CONTINUE
(2858)   C
(2859)   C  INTERPOLATE INTO PLUME TO GET VISUAL RANGE
(2860)   C
(2861)         DELRV= (3.912-TAUT1)/(TAUTOT-TAUT1) *XALONG
(2862)         IF(NROBJ.GT.1)GO TO 1165
(2863)         RV=(DIST(NX)-DIST(NX+1-NXX))/1000.+DELRV
(2864)         GO TO 1170
(2865)   1165  CONTINUE
(2866)         RV=ROBJ(NR1)*RVAMB+(DIST(NX)-DIST(NX+1-NXX))/1000.+DELRV
(2867)   1170  CONTINUE
(2868)   C
(2869)   C  REDUCTION IN VISUAL RANGE
(2870)   C
(2871)         REDRV=((RVAMB-RV)/RVAMB)*100.
(2872)   C
(2873)   C  DISTANCE WITHIN PLUME
(2874)   C
(2875)         ALONG=(DIST(NX)-DIST(NXX1))/1000.
(2876)         IF(NROBJ.GT.1)GO TO 1180
(2877)         RR=0.
(2878)         GO TO 1190
(2879)   1180  RR=ROBJ(NR1)
(2880)   1190  WRITE(6,67)ALONG,RR,RV,REDRV,YCAP,VAL,X,Y,YCAPD,VALD,CONT2
(2881)        1,BRATIO,XD,YD,DELUV,DELAB
(2882)   1200  CONTINUE
(2883)   C
(2884)   C  CHECK IF AT END OF LOOP ON INDEX FOR SCATTERING ANGLES FOR
(2885)   C  THE PLUME-BASED CASE CALCULATIONS.
(2886)   C
(2887)         IF(NT.LT.(NT2-1))GO TO 1001
(2888)   1300  CONTINUE
(2889)   1301  CONTINUE
(2890)    1000 CONTINUE
(2891)   C
(2892)   C  PRINT THE SO4 AND NO3 FORMATION RATES FOR EACH PLUME PARCEL AT X,Z,T.
(2893)   C
(2894)         DO 30020 NT=1,NX2
(2895)         WRITE(6,10)
(2896)         XKM=DIST(NT)/1000.
(2897)         WRITE(6,30010)XKM
(2898)   30010 FORMAT(47H HISTORY OF PLUME PARCEL AT DOWNWIND DISTANCE =,F6.1,
(2899)        1 3H KM,//)
(2900)         WRITE(6,30011)
(2901)   30011 FORMAT(4X,6HPARCEL,5X,5HLOCAL,5X,2X,
(2902)        1 34HSO2-TO-SO4= CONVERSION RATE (%/HR),5X,2X,
(2903)        1 34HNOX-TO-HNO3 CONVERSION RATE (%/HR))
(2904)         WRITE(6,30012) (ALT(NZ),NZ=1,6),(ALT(NZ),NZ=1,6)
(2905)   30012 FORMAT(6X,3HAGE,7X,4HTIME,/,6X,4H(HR),10X,5X,6(2X,A4),5X,6(2X,A4),
(2906)        1 /)
(2907)         DO 30020 NX=1,NT
(2908)         DTIME=((DIST(NT)-DIST(NX))/U)/3600.
(2909)         TIMER=TIMEHR-DTIME
(2910)   30013 IF(TIMER.GT.0.)GO TO 30014
(2911)         TIMER=TIMER+24.
(2912)         GO TO 30013
```

Exhibit B-1 (Continued)

```
(2913)   30014 CONTINUE
(2914)         ITIMER=INT(TIMER)*100+INT(AMOD(TIMER,1.)*60.)
(2915)         PLMAGE=(DIST(NX)/U)/3600.
(2916)         WRITE(6,30015) PLMAGE,ITIMER,(RSO2R(NX,NZ,NT),NZ=1,6),
(2917)        1 (RNOXR(NX,NZ,NT),NZ=1,6)
(2918)   30015 FORMAT(5X,F5.1,6X,I4,2(5X,6F6.2))
(2919)   30020 CONTINUE
(2920)         DO 50018 NX=1,16
(2921)   50018 DIST(NX)=DIST(NX)/1000.
(2922)         WRITE(6,50001)
(2923)   50001 FORMAT(1H1,55X,22HPLOT FILE VERIFICATION)
(2924)         IF(NC2.NE.2)GO TO 30025
(2925)   C
(2926)   C  WRITE OUT THE VISUAL IMPACT PARAMETERS FOR PLOTTING OF THE
(2927)   C  RESULTS OF OBSERVER-BASED CALCULATIONS. PLT1 IS PERCENT REDUCTION
(2928)   C  IN VISUAL RANGE, FOR THE 16 DOWNWIND POINTS.NN=1 FOR CLEAR
(2929)   C  SKY BACKGROUND. NN=2 FOR WHITE BACKGROUND.  NN=3 FOR GRAY
(2930)   C  BACKGROUND.  NN=4 FOR BLACK BACKGROUND.  PLT1 IS SET TO
(2931)   C  ZERO FOR NN=2,3,4. PLT2 = BLUE-RED RATIO.  PLT3 = PLUME
(2932)   C  CONTRAST AT 0.55 MICROMETER.  PLT4 = DELTA E(LAB).
(2933)   C
(2934)         WRITE(7)((PLT1(NX,NN),NX=1,16),NN=1,4)
(2935)         WRITE(7)((PLT2(NX,NN),NX=1,16),NN=1,4)
(2936)         WRITE(7)((PLT3(NX,NN),NX=1,16),NN=1,4)
(2937)         WRITE(7)((PLT4(NX,NN),NX=1,16),NN=1,4)
(2938)         WRITE(6,50002)
(2939)   50002 FORMAT(1H0,56X,19HOBSERVER-BASED DATA)
(2940)         WRITE(6,50003)
(2941)   50003 FORMAT(1H0,5X,14HSKY BACKGROUND)
(2942)         WRITE(6,50004)(NN,NN=NX1,NX2)
(2943)   50004 FORMAT(1H0,9X,2HNX,7X,16(5X,I2))
(2944)         WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(2945)   50005 FORMAT(1H0,3X,13HDISTANCE (KM),2X,16(3X,F4.0))
(2946)         WRITE(6,50006)
(2947)   50006 FORMAT(1H0,1X,19HREDUCTION OF VISUAL)
(2948)         WRITE(6,50007)(PLT1(NX,1),NX=NX1,NX2)
(2949)   50007 FORMAT(1H ,5X,9HRANGE (%),6X,16(1X,F6.3))
(2950)         WRITE(6,50008)
(2951)   50008 FORMAT(1H0,2X,14HBLUE-RED RATIO)
(2952)         WRITE(6,50009)(PLT2(NX,1),NX=NX1,NX2)
(2953)   50009 FORMAT(1H ,20X,16(1X,F6.3))
(2954)         WRITE(6,50010)
(2955)   50010 FORMAT(1H0,2X,17HPLUME CONTRAST AT)
(2956)         WRITE(6,50011)(PLT3(NX,1),NX=NX1,NX2)
(2957)   50011 FORMAT(1H ,5X,12H0.55 MICRONS,3X,16(1X,F6.3))
(2958)         WRITE(6,50012)
(2959)   50012 FORMAT(1H0,20HPLUME PERCEPTIBILITY)
(2960)         WRITE(6,50013)(PLT4(NX,1),NX=1,NX2)
(2961)   50013 FORMAT(1H ,3X,15HDELTA E(L*A*B*),2X,16(1X,F6.3))
(2962)         WRITE(6,50014)
(2963)   50014 FORMAT(/,1H0,3X,16HWHITE BACKGROUND)
(2964)         WRITE(6,50004)(NN,NN=NX1,NX2)
(2965)         WRITE(6,50003)(DIST(NX),NX=NX1,NX2)
(2966)         WRITE(6,50006)
(2967)         WRITE(6,50007)(PLT1(NX,2),NX=NX1,NX2)
(2968)         WRITE(6,50008)
```

Exhibit B-1 (Continued)

```
(2969)          WRITE(6,50009)(PLT2(NX,2),NX=NX1,NX2)
(2970)          WRITE(6,50010)
(2971)          WRITE(6,50011)(PLT3(NX,2),NX=NX1,NX2)
(2972)          WRITE(6,50012)
(2973)          WRITE(6,50013)(PLT4(NX,2),NX=NX1,NX2)
(2974)          WRITE(6,50015)
(2975)   50015 FORMAT(/,1H0,4X,15HGRAY BACKGROUND)
(2976)          WRITE(6,50004)(NN,NN=NX1,NX2)
(2977)          WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(2978)          WRITE(6,50006)
(2979)          WRITE(6,50007)(PLT1(NX,3),NX=NX1,NX2)
(2980)          WRITE(6,50008)
(2981)          WRITE(6,50009)(PLT2(NX,3),NX=NX1,NX2)
(2982)          WRITE(6,50010)
(2983)          WRITE(6,50011)(PLT3(NX,3),NX=NX1,NX2)
(2984)          WRITE(6,50012)
(2985)          WRITE(6,50013)(PLT4(NX,3),NX=NX1,NX2)
(2986)          WRITE(6,50016)
(2987)   50016 FORMAT(1H1,3X,16HBLACK BACKGROUND)
(2988)          WRITE(6,50004)(NN,NN=NX1,NX2)
(2989)          WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(2990)          WRITE(6,50006)
(2991)          WRITE(6,50007)(PLT1(NX,4),NX=NX1,NX2)
(2992)          WRITE(6,50008)
(2993)          WRITE(6,50009)(PLT2(NX,4),NX=NX1,NX2)
(2994)          WRITE(6,50010)
(2995)          WRITE(6,50011)(PLT3(NX,4),NX=NX1,NX2)
(2996)          WRITE(6,50012)
(2997)          WRITE(6,50013)(PLT4(NX,4),NX=NX1,NX2)
(2998)          IF(NC1.NE.1)GO TO 30030
(2999)   C
(3000)   C  VISUAL IMPACT PARAMETERS FOR PLOTTING OF THE RESULTS OF
(3001)   C  THE PLUME-BASED CALCULATIONS WITH THE DESIRED SCATTERING ANGLE
(3002)   C  DISTANCES, AND PLUME-OBSERVER GEOMETRY AS SPECIFIED IN THE
(3003)   C  PLUME-BASED CALCULATIONS FOR CLEAR SKY AND WHITE, GRAY, AND
(3004)   C  BLACK BACKGROUNDS.
(3005)   C
(3006)   30025 CONTINUE
(3007)          WRITE(8)((PLOT1(NX,NN),NX=1,16),NN=1,4)
(3008)          WRITE(8)((PLOT2(NX,NN),NX=1,16),NN=1,4)
(3009)          WRITE(8)((PLOT3(NX,NN),NX=1,16),NN=1,4)
(3010)          WRITE(8)((PLOT4(NX,NN),NX=1,16),NN=1,4)
(3011)          IF(NC2.NE.1)WRITE(6,50001)
(3012)          WRITE(6,50017)
(3013)   50017 FORMAT(1H0,37X,16HPLUME-BASED DATA)
(3014)          WRITE(6,50003)
(3015)          WRITE(6,50004)(NN,NN=NX1,NX2)
(3016)          WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(3017)          WRITE(6,50006)
(3018)          WRITE(6,50007)(PLOT1(NX,1),NX=NX1,NX2)
(3019)          WRITE(6,50008)
(3020)          WRITE(6,50009)(PLOT2(NX,1),NX=NX1,NX2)
(3021)          WRITE(6,50010)
(3022)          WRITE(6,50011)(PLOT3(NX,1),NX=NX1,NX2)
(3023)          WRITE(6,50012)
(3024)          WRITE(6,50013)(PLOT4(NX,1),NX=NX1,NX2)
```

Exhibit B-1 (Continued)

```
(3025)          WRITE(6,50014)
(3026)          WRITE(6,50004)(NN,NN=NX1,NX2)
(3027)          WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(3028)          WRITE(6,50006)
(3029)          WRITE(6,50007)(PLOT1(NX,2),NX=NX1,NX2)
(3030)          WRITE(6,50008)
(3031)          WRITE(6,50009)(PLOT2(NX,2),NX=NX1,NX2)
(3032)          WRITE(6,50010)
(3033)          WRITE(6,50011)(PLOT3(NX,2),NX=NX1,NX2)
(3034)          WRITE(6,50012)
(3035)          WRITE(6,50013)(PLOT4(NX,2),NX=NX1,NX2)
(3036)          WRITE(6,50015)
(3037)          WRITE(6,50004)(NN,NN=NX1,NX2)
(3038)          WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(3039)          WRITE(6,50006)
(3040)          WRITE(6,50007)(PLOT1(NX,3),NX=NX1,NX2)
(3041)          WRITE(6,50008)
(3042)          WRITE(6,50009)(PLOT2(NX,3),NX=NX1,NX2)
(3043)          WRITE(6,50010)
(3044)          WRITE(6,50011)(PLOT3(NX,3),NX=NX1,NX2)
(3045)          WRITE(6,50012)
(3046)          WRITE(6,50013)(PLOT4(NX,3),NX=NX1,NX2)
(3047)          WRITE(6,50016)
(3048)          WRITE(6,50004)(NN,NN=NX1,NX2)
(3049)          WRITE(6,50005)(DIST(NX),NX=NX1,NX2)
(3050)          WRITE(6,50006)
(3051)          WRITE(6,50007)(PLOT1(NX,4),NX=NX1,NX2)
(3052)          WRITE(6,50008)
(3053)          WRITE(6,50009)(PLOT2(NX,4),NX=NX1,NX2)
(3054)          WRITE(6,50010)
(3055)          WRITE(6,50011)(PLOT3(NX,4),NX=NX1,NX2)
(3056)          WRITE(6,50012)
(3057)          WRITE(6,50013)(PLOT4(NX,4),NX=NX1,NX2)
(3058)   30030 CONTINUE
(3059)          ENDFILE 7
(3060)          ENDFILE 8
(3061)          STOP
(3062)          END
```

BLOCK DATA

```
(3063)          BLOCK DATA
(3064)          COMMON/MIESCT/ROG,SIGMA,NLAMB,LAMB(20),JX,IT,TT(200),DUM(20),
(3065)         1PDUM(20,200)
(3066)          COMMON/ MISC/ ABSNO2(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3067)         1,NTHETA
(3068)          COMMON/COLOR/YCAP,VAL,X,Y,YCAPD,VALD,XD,YD,DELUV,DELAB,
(3069)         1XBAR(39),YBAR(39),ZBAR(39),PI,CONT1,CONT2,CONT3,BRATIO
(3070)          REAL LAMB
(3071)          DATA LAMB / 0.35,0.40,0.45,0.50,0.55,0.60,0.65,0.70,0.75,11*0.0/
(3072)          DATA TT /0.,22.,45.,90.,135.,158.,180.,193*0./
(3073)          DATA NLAMB / 9 /
(3074)          DATA NTHETA / 7 /
(3075)          DATA ABSNO2 /1.58, 1.63,1.67,1.71,1.67, 1.63, 1.54, 1.45,
(3076)         1              1.36, 1.17, 1.06, 0.92, 0.80, 0.69, 0.61, 0.54,
(3077)         2              0.46, 0.39, 0.31, 0.26, 0.21, 0.18, 0.15, 0.12, 0.1,
(3078)         3              0.080, 0.063, 0.053, 0.041, 0.035, 0.029, 0.024,
(3079)         4              0.021, 0.017, 0.014, 0.010, 0.0068, 0.0034,0./
(3080)          DATA  SOLAR / 1163., 1124., 1121., 1423., 1730., 1740., 1659.,
(3081)         1 1801., 1998., 2059., 2040., 2042., 1959., 1941., 1879., 1838.,
(3082)         2 1839., 1785., 1731., 1704., 1712., 1716., 1699., 1640., 1635.,
(3083)         3 1602., 1570., 1544., 1511., 1466., 1456., 1427., 1402., 1369.,
(3084)         4 1344., 1314., 1290.,1260., 1235.   /
(3085)          DATA XBAR /  0.0000, 0.0014, 0.0042, 0.0143, 0.0435, 0.1344,
(3086)         1 0.2839, 0.3483, 0.3362, 0.2908, 0.1954, 0.0956, 0.0320,
(3087)         2 0.0049, 0.0093, 0.0633, 0.1655, 0.2904, 0.4334, 0.5945, 0.7621,
(3088)         3 0.9163, 1.0263, 1.0622, 1.0026, 0.8544, 0.6424, 0.4479, 0.2835,
(3089)         4 0.1649, 0.0874, 0.0468, 0.0227, 0.0114, 0.0058, 0.0029, 0.0014,
(3090)         5 0.0007, 0.0003 /
(3091)          DATA YBAR / 0.0000, 0.0000, 0.0001, 0.0004, 0.0012, 0.0040,
(3092)         1 0.0116, 0.0230, 0.0380, 0.0600,0.0910, 0.1390, 0.2080, 0.3230,
(3093)         2 0.5030, 0.7100, 0.8620, 0.9540, 0.9950, 0.9950, 0.9520, 0.8700,
(3094)         3 0.7570,0.6310, 0.5030, 0.3810, 0.2650, 0.1750, 0.1070, 0.0610,
(3095)         4 0.0320, 0.0170, 0.0082, 0.0041, 0.0021, 0.0010, 0.0005, 0.0002,
(3096)         5 0.0001   /
(3097)          DATA ZBAR / 0.0000, 0.0065, 0.0201, 0.0679, 0.2074, 0.6456,
(3098)         1 1.3856, 1.7471, 1.7721, 1.6692, 1.2876, 0.8130, 0.4652, 0.2720,
(3099)         2 0.1582, 0.0782, 0.0422, 0.0203, 0.0087, 0.0039, 0.0021, 0.0017,
(3100)         3 0.0011, 0.0008, 0.0003, 0.0002, 13*0.0000 /
(3101)          END
```

```
      FUNCTION ERF(XX)
```

```
(3102)          FUNCTION ERF(XX)
(3103)    C
(3104)    C  ERF=2/SQRT(PI)*INTEGRAL OF EXP(-T*T) FROM 0 TO X.
(3105)    C  USING AN APPROXIMATION DUE TO HASTINGS  GOOD TO SEVEN SI
(3106)    C  USING AN APPROXIMATION DUE TO HASTINGS. ABSOLUTE ERROR ABOUT 3E-7
(3107)    C
(3108)          DIMENSION A(6)
(3109)          DATA A/.0000430638,.0002765672,.0001520143,.0092705272,.0422820123
(3110)         1,.0705230784 /
(3111)          X=ABS(XX)
(3112)          T=A(1)*X
(3113)          DO 10 I=2,6
(3114)          T=(T+A(I))*X
(3115)       10 CONTINUE
(3116)          T=1./(T+1.)
(3117)          ERF=1.-T**16
(3118)          IF(XX.LT.0.)ERF=-ERF
(3119)          RETURN
(3120)          END
```

```
      SUBROUTINE PERDIF(SPECR,ZENITH)
```

```
(3121)          SUBROUTINE PERDIF(SPECR,ZENITH)
(3122)    C*****
(3123)    C*****    CALCULATE PERFECT DIFFUSE REFLECTOR PROPERTIES
(3124)    C*****
(3125)          COMMON/REF/XCAP0,YCAP0,ZCAP0,U0,V0,PROP
(3126)          COMMON/COLOR/YCAP,VAL,X,Y,YCAPD,VALD,XD,YD,DELUV,DELAB,
(3127)         1XBAR(39),YBAR(39),ZBAR(39),PI,CONT1,CONT2,CONT3,BRATIO
(3128)          DIMENSION SPECR(39)
(3129)          PI = 3.1415962
(3130)          XLUMIN=1./(2.*PI)
(3131)          CALL BACOBJ(ZENITH,90.,90.,4.,0.,SPECR,XLUMIN)
(3132)          XCAP0=0.
(3133)          YCAP0=0.
(3134)          ZCAP0=0.
(3135)          DO 10 I=1,39
(3136)          XCAP0=XCAP0+SPECR(I)*XBAR(I)
(3137)          YCAP0=YCAP0+SPECR(I)*YBAR(I)
(3138)          ZCAP0=ZCAP0+SPECR(I)*ZBAR(I)
(3139)       10 CONTINUE
(3140)          PROP=100./YCAP0
(3141)          XCAP0=XCAP0*PROP
(3142)          YCAP0=100.
(3143)          ZCAP0=ZCAP0*PROP
(3144)          D0=XCAP0+1500.+3.*ZCAP0
(3145)          U0=4.*XCAP0/D0
(3146)          V0=900./D0
(3147)          RETURN
(3148)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE CHROMA(SPECB,SPECR)
```

```
(3149)          SUBROUTINE CHROMA(SPECB,SPECR)
(3150)    C*****
(3151)    C***** CALCULATES VARIOUS COLORATION PARAMETERS SUCH AS CHROMA-
(3152)    C***** TICITY COORDINATES,LUMINANCE,VALUE,CONTRAST,BLUE-RED RATIO,
(3153)    C***** AND DELTA E.
(3154)    C*****
(3155)          COMMON/COLOR/YCAP,VAL,X,Y,YCAPD,VALD,XD,YD,DELUV,DELAB,
(3156)         1XBAR(39),YBAR(39),ZBAR(39),PI,CONT1,CONT2,CONT3,BRATIO
(3157)          COMMON/REF/XCAP0,YCAP0,ZCAP0,U0,V0,PROP
(3158)          DIMENSION SPECB(39),SPECR(39)
(3159)          XCAP=0.
(3160)          YCAP=0.
(3161)          ZCAP=0.
(3162)          XCAPR=0.
(3163)          YCAPR=0.
(3164)          ZCAPR=0.
(3165)          DO 10 I=1,39
(3166)          XCAP=XCAP+SPECB(I)*XBAR(I)
(3167)          YCAP=YCAP+SPECB(I)*YBAR(I)
(3168)          ZCAP=ZCAP+SPECB(I)*ZBAR(I)
(3169)          XCAPR=XCAPR+SPECR(I)*XBAR(I)
(3170)          YCAPR=YCAPR+SPECR(I)*YBAR(I)
(3171)          ZCAPR=ZCAPR+SPECR(I)*ZBAR(I)
(3172)     10   CONTINUE
(3173)          XCAP=XCAP*PROP
(3174)          YCAP=YCAP*PROP
(3175)          ZCAP=ZCAP*PROP
(3176)          TXYZ=XCAP+YCAP+ZCAP
(3177)          XCAPR=XCAPR*PROP
(3178)          YCAPR=YCAPR*PROP
(3179)          ZCAPR=ZCAPR*PROP
(3180)          TXYZR=XCAPR+YCAPR+ZCAPR
(3181)          X=XCAP/TXYZ
(3182)          Y=YCAP/TXYZ
(3183)          XR=XCAPR/TXYZR
(3184)          YR=YCAPR/TXYZR
(3185)          XD=X-XR
(3186)          YD=Y-YR
(3187)          YCAPD=YCAP-YCAPR
(3188)          D=XCAP+15.*YCAP+3.*ZCAP
(3189)          DR=XCAPR+15.*YCAPR+3.*ZCAPR
(3190)          U=4.*XCAP/D
(3191)          V=9.*YCAP/D
(3192)          UR=4.*XCAPR/DR
(3193)          VR=9.*YCAPR/DR
(3194)          CONT1=(SPECB(4)-SPECR(4))/SPECR(4)
(3195)          CONT2=(SPECB(19)-SPECR(19))/SPECR(19)
(3196)          CONT3=(SPECB(34)-SPECR(34))/SPECR(34)
(3197)          BRATIO=(SPECB(4)/SPECR(4))/(SPECB(34)/SPECR(34))
(3198)          VAL=116.*(YCAP/YCAP0)**.333-16.
(3199)          VALR=116.*(YCAPR/YCAP0)**.333-16.
(3200)          USTAR=13.*VAL*(U-U0)
(3201)          USTARR=13.*VALR*(UR-U0)
(3202)          VSTAR=13.*VAL*(V-V0)
(3203)          VSTARR=13.*VALR*(VR-V0)
(3204)          ASTAR=500.*((XCAP/XCAP0)**.333-(YCAP/YCAP0)**.333)
```

Exhibit B-1 (Continued)

```
      SUBROUTINE CHROMA(SPECB,SPECR)

(3205)          ASTARR=500.*((XCAPR/XCAP0)**.333-(YCAPR/YCAP0)**.333)
(3206)          BSTAR=200.*((YCAP/YCAP0)**.333-(ZCAP/ZCAP0)**.333)
(3207)          BSTARR=200.*((YCAPR/YCAP0)**.333-(ZCAPR/ZCAP0)**.333)
(3208)          VALD=VAL-VALR
(3209)          USTARD=USTAR-USTARR
(3210)          VSTARD=VSTAR-VSTARR
(3211)          ASTARD=ASTAR-ASTARR
(3212)          BSTARD=BSTAR-BSTARR
(3213)          DELUV=SQRT(VALD*VALD+USTARD*USTARD+VSTARD*VSTARD)
(3214)          DELAB=SQRT(VALD*VALD+ASTARD*ASTARD+BSTARD*BSTARD)
(3215)          RETURN
(3216)          END
```

Exhibit B-1 (Continued)

```
      FUNCTION SYTVA(I,X)
```

```
(3217)          FUNCTION SYTVA(I,X)
(3218)          REAL A(6),B(6),C(6),D(6),LOGX
(3219)          DATA A/-.04054,-.04092,-.02536,-.02398,-.01837,-.01766/
(3220)          DATA B/.4871,.4745,.3092,.2857,.2165,.2022/
(3221)          DATA C/-1.16,-1.108,-.5988,-.5402,-.3099,-.2681/
(3222)          DATA D/2.057,1.993,1.497,1.459,1.217,1.174/
(3223)          LOGX=ALOG10(X)
(3224)          SYTVA=10.**(A(I)*LOGX*LOGX*LOGX+B(I)*LOGX*LOGX+C(I)*LOGX+D(I))
(3225)          RETURN
(3226)          END
```

Exhibit B-1 (Continued)

```
      FUNCTION SZTVA(I,X)
```

```
(3227)          FUNCTION SZTVA(I,X)
(3228)          REAL A(6),B(6),C(6),D(6),LOGX
(3229)          DATA A/-.04057,-.02174,-.01092,.002771,.006483,.009586/
(3230)          DATA B/.4847,.2555,.1266,-.03534.-.08176,-.1183/
(3231)          DATA C/-1.149,-.4799,-.1457,.369,.5107,.6285/
(3232)          DATA D/2.027,1.382,1.09,.5842,.4429,.3116/
(3233)          LOGX=ALOG10(X)
(3234)          SZTVA=10.**(A(I)*LOGX*LOGX*LOGX+B(I)*LOGX*LOGX+C(I)*LOGX+D(I))
(3235)          RETURN
(3236)          END
```

Exhibit B-1 (Continued)

FUNCTION SYPAS(I,X)

```
(3237)          FUNCTION SYPAS(I,X)
(3238)    C
(3239)    C    PASQUILL-GIFFORD HORIZONTAL DISPERSION COEFFICIENT (SIGMA Y)
(3240)    C
(3241)          REAL A(7),B(7),C(7),D(7),LOGX
(3242)          DATA A/-.012280,-.02334,-.008289,-.0062276,-.009115,-.0032318,0./
(3243)          DATA B/.00028741,.028256,-.0022985,-.0056984,-.0017835,-.011057,0.
(3244)         1/
(3245)          DATA C/.89182,.91347,.91977,.92394,.92826,.92159,0./
(3246)          DATA D/2.3237,2.1556,2.0142,1.8288,1.7006,1.5289,0./
(3247)          IF(I.EQ.7) GO TO 1
(3248)          LOGX=ALOG10(X/1000.)
(3249)          SYPAS=10.**(A(I)*LOGX*LOGX*LOGX+B(I)*LOGX*LOGX+C(I)*LOGX+D(I))
(3250)          RETURN
(3251)    1     LOGX=ALOG10(X)
(3252)          SYPAS=10.**(-.0020555*LOGX*LOGX*LOGX-.014857*LOGX*LOGX+1.0648*
(3253)         1LOGX-1.6212)
(3254)          RETURN
(3255)          END
```

Exhibit B-1 (Continued)

```
      FUNCTION SZPAS(I,X)
```

```
(3256)            FUNCTION SZPAS(I,X)
(3257)      C
(3258)      C     PASQUILL-GIFFORD VERTICAL DISPERSION COEFFICIENT (SIGMA Z).
(3259)      C
(3260)            REAL A(7),B(7),C(7),D(7),LOGX
(3261)            DATA A/1.157,-.031027,-.0045741,.011157,-.0003092,.0037608,0./
(3262)            DATA B/2.815,.050674,.0040771,-.093465,-.10332,-.12889,0./
(3263)            DATA C/3.316,1.0827,.92084,.72583,.67969,.65602,0./
(3264)            DATA D/2.804,2.0327,1.7824,1.4901,1.3284,1.1391,0./
(3265)            IF(I.EQ.7) GO TO 1
(3266)            LOGX=ALOG10(X/1000.)
(3267)            SZPAS=10.**(A(I)*LOGX*LOGX*LOGX+B(I)*LOGX*LOGX+C(I)*LOGX+D(I))
(3268)            RETURN
(3269)          1 LOGX=ALOG10(X)
(3270)            SZPAS=10.**(-.0086351*LOGX*LOGX*LOGX-.036447*LOGX*LOGX+1.1243*LOGX
(3271)           1-1.8981)
(3272)            RETURN
(3273)            END
```

Exhibit B-1 (Continued)

SUBROUTINE INRAD

```
(3274)          SUBROUTINE INRAD
(3275)    C
(3276)    C     CALCULATE OPTICAL PROPERTIES OF BACKGROUND ATMOSPHERE AND FOUR
(3277)    C     AEROSOL MODES
(3278)    C
(3279)          REAL LAMB
(3280)          COMMON/BCKGND/ ELEV,RVAMB,ACCAMB,AMBNO2,RH,ROVA,ROVC,ROVS,ROVP,
(3281)         1SIGA,SIGC,SIGS,SIGP,HPBL,IREAD,CORAMB,AMBNO3,AMBSO4,INTYP
(3282)         2,DENA,DENC,DENP,DENS
(3283)          COMMON/MIESCT/ROG,SIGMA,NLAMB,LAMB(20),JX,IT,TT(200),DUM(20),
(3284)         1PDUM(20,200)
(3285)          COMMON/RADPRP/BTASO4(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(3286)         1PAER(39,27),PPRIM(39,27),PSO4(39,27),PCOR(39,27),BTABAC(39)
(3287)          COMMON / OPTDEP / TAT0IZ(39),TATHIZ(39),TAT0HZ(39),X1(39),
(3288)         1X2(39),TAUTDI(39),TAUT0D(39),XHDI(39),XH0D(39)
(3289)          COMMON/ MISC/ ABSNO2(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3290)         1,NTHETA
(3291)          DIMENSION DUMP(41),D(2)
(3292)          DIMENSION COEF(57),W(57)
(3293)          DIMENSION WINK(9),REL(9)
(3294)          DATA WINK / 0. , 0.03 , 0.05 , 0.1 , 0.18 , 0.3 , 0.5,0.75 , 1. /
(3295)          DATA D / 0.,0. /
(3296)          IREAD = 0
(3297)          TWOPI = 2.*3.141596
(3298)          FORPI = 2.*TWOPI
(3299)          FORPIN = 1./FORPI
(3300)          SQRTPI = SQRT(3.141596)
(3301)          SQR2PI = SQRTPI*SQRT(2.)
(3302)          HR = 9.8
(3303)          HA=3.5
(3304)          CONR = SQRT(2.*6356.*HR)
(3305)          CONA = SQRT(2.*6356.*HA)
(3306)          PARMA = CONA*SQRTPI*0.5
(3307)          PARMR = CONR*SQRTPI*0.5
(3308)          DX = SQRT(2.*6356.*HPBL)
(3309)          DR = DX/CONR
(3310)          DA = DX/CONA
(3311)    C***  COMPUTE THE BACKGROUND RADIATIVE PROPERTIES
(3312)    C*****
(3313)    C*****
(3314)    C*** GENERATE THE BSCAT TO MASS RATIOS AND THE PHASE FUNCTIONS
(3315)    C*****
(3316)    C*****
(3317)    C***  ACCUMULATION MODE
(3318)    C*****
(3319)          ROG = ROVA
(3320)          SIGMA = SIGA
(3321)          DO 5 I = 1,39
(3322)        5 DUMP(I) = 0.36 + 0.01*FLOAT(I)
(3323)          IF(IREAD.EQ.1) GO TO 210
(3324)          CALL BSIZE
(3325)          GO TO 250
(3326)      210 READ(5,1100) (    DUM(I),I=1,NLAMB)
(3327)          DO 220 I = 1,NLAMB
(3328)      220 READ(5,1200) (PDUM(I,J),J=1,NTHETA)
(3329)      250 CONTINUE
```

Exhibit B-1 (Continued)

```
      SUBROUTINE INRAD


(3330)    1100 FORMAT(9F7.4)
(3331)    1200 FORMAT(7E11.4)
(3332)         CALL SPLNA (NLAMB,LAMB,DUM,2,D,COEF,W)
(3333)         DO 12 I = 1,39
(3334)         X = DUMP(I)
(3335)         DO 13 J = 2,NLAMB
(3336)   13    IF(X.LE.LAMB(J)) GO TO 14
(3337)      14 Q = LAMB(J) - LAMB(J-1)
(3338)         Z = (X - LAMB(J-1))/Q
(3339)      12 BTAS04(I) =((Z*COEF(3*J-3)+COEF(3*J-4))*Z+COEF(3*J-5))*Z+DUM(J-1)
(3340)         DO 10 JT = 1,NTHETA
(3341)         DO 15 I = 1,NLAMB
(3342)      15 DUM(I) = PDUM(I,JT)
(3343)         CALL SPLNA (NLAMB,LAMB,DUM,2,D,COEF,W)
(3344)         DO 17 I = 1,39
(3345)         X = DUMP(I)
(3346)         DO 18 J = 2,NLAMB
(3347)   18    IF(X.LE.LAMB(J)) GO TO 19
(3348)      19 Q = LAMB(J) - LAMB(J-1)
(3349)         Z = (X - LAMB(J-1))/Q
(3350)      17 PS04(I,JT) =((Z*COEF(3*J-3)+COEF(3*J-4))*Z+COEF(3*J-5))*Z+DUM(J-1)
(3351)      10 CONTINUE
(3352)   C*****
(3353)   C*****
(3354)   C*****
(3355)   C***  COARSE PARTICLE MODE
(3356)   C*****
(3357)         ROG = ROVC
(3358)         SIGMA = SIGC
(3359)         IF(IREAD.EQ.1) GO TO 310
(3360)         CALL BSIZE
(3361)         GO TO 350
(3362)    310 READ(5,1100) (    DUM(I),I=1,NLAMB)
(3363)         DO 320 I = 1,NLAMB
(3364)    320 READ(5,1200) (PDUM(I,J),J=1,NTHETA)
(3365)    350 CONTINUE
(3366)         CALL SPLNA (NLAMB,LAMB,DUM,2,D,COEF,W)
(3367)         DO 22 I = 1,39
(3368)         X = DUMP(I)
(3369)         DO 23 J = 2,NLAMB
(3370)   23    IF(X.LE.LAMB(J)) GO TO 24
(3371)      24 Q = LAMB(J) - LAMB(J-1)
(3372)         Z = (X - LAMB(J-1))/Q
(3373)      22 BTACOR(I) =((Z*COEF(3*J-3)+COEF(3*J-4))*Z+COEF(3*J-5))*Z+DUM(J-1)
(3374)         DO 20 JT = 1,NTHETA
(3375)         DO 25 I = 1,NLAMB
(3376)   25    DUM(I) = PDUM(I,JT)
(3377)         CALL SPLNA (NLAMB,LAMB,DUM,2,D,COEF,W)
(3378)         DO 27 I = 1,39
(3379)         X = DUMP(I)
(3380)         DO 28 J = 2,NLAMB
(3381)   28    IF(X.LE.LAMB(J)) GO TO 29
(3382)      29 Q = LAMB(J) - LAMB(J-1)
(3383)         Z = (X - LAMB(J-1))/Q
(3384)      27 PCOR(I,JT) =((Z*COEF(3*J-3)+COEF(3*J-4))*Z+COEF(3*J-5))*Z+DUM(J-1)
(3385)      20 CONTINUE
```

Exhibit B-1 (Continued)

```
      SUBROUTINE INRAD

(3386)  C*****
(3387)  C*** COMPUTE THE PRIMARY PARTICULATE PROPERTIES
(3388)  C*****
(3389)        ROG = ROVP
(3390)        SIGMA = SIGP
(3391)        IF(IREAD.EQ.1) GO TO 410
(3392)        CALL DSIZE
(3393)        GO TO 450
(3394)    410 READ(5,1100) (DUM(I),I=1,NLAMB)
(3395)        DO 420 I = 1,NLAMB
(3396)    420 READ(5,1200) (PDUM(I,J),J=1,NTHETA)
(3397)    450 CONTINUE
(3398)        CALL SPLNA (NLAMB,LAMB,DUM,2,D,COEF,W)
(3399)        DO 32 I = 1,39
(3400)        X = DUMP(I)
(3401)        DO 33 J = 2,NLAMB
(3402)     33 IF(X.LE.LAMB(J)) GO TO 34
(3403)     34 Q = LAMB(J) - LAMB(J-1)
(3404)        Z = (X - LAMB(J-1))/Q
(3405)     32 BTAPRM(I) =((Z*COEF(3*J-3)+COEF(3*J-4))*Z+COEF(3*J-5))*Z+DUM(J-1)
(3406)        DO 30 JT = 1,NTHETA
(3407)        DO 35 I = 1,NLAMB
(3408)     35 DUM(I) = PDUM(I,JT)
(3409)        CALL SPLNA (NLAMB,LAMB,DUM,2,D,COEF,W)
(3410)        DO 37 I = 1,39
(3411)        X = DUMP(I)
(3412)        DO 38 J = 2,NLAMB
(3413)     38 IF(X.LE.LAMB(J)) GO TO 39
(3414)     39 Q = LAMB(J) - LAMB(J-1)
(3415)        Z = (X - LAMB(J-1))/Q
(3416)     37 PPRIM(I,JT)=((Z*COEF(3*J-3)+COEF(3*J-4))*Z+COEF(3*J-5))*Z+DUM(J-1)
(3417)     30 CONTINUE
(3418)  C*****
(3419)  C*** ADJUST FOR THE RELATIVE HUMIDITY
(3420)  C*****
(3421)        DO 41 I = 1,9
(3422)     41 REL(I) = 0.1*FLOAT(I-1)
(3423)        CALL SPLNA(9,REL,WINK,2,D,COEF,W)
(3424)        DO 42 I = 2,9
(3425)     42 IF(RH.LE.REL(I)) GO TO 43
(3426)     43 Z = (RH-REL(I-1))*10.
(3427)        FH = ((Z*COEF(3*I-3)+COEF(3*I-4))*Z+COEF(3*I-5))*Z+WINK(I-1)
(3428)        FACT =  1. + (0.85*FH)/(1.-RH) /DENA
(3429)        DO 40 I = 1,39
(3430)     40 BTASO4(I) = BTASO4(I)*FACT
(3431)  C*****
(3432)  C***  DETERMINE THE TYPE OF INPUT AND COMPUTE THE BACKGROUND RADIATIVE
(3433)  C***  PROPERTIES.  INTYP = 1 MEANS THE NO3,SO4,COARSE MODE LEVEELS ARE
(3434)  C***  SPECIFIED IN UGM/M3.  INTYPE = 2 MEANS THE VISUAL RANGE AND
(3435)  C***  THE ACCUMULATION MODE ARE SPECIFIED IN KM-1 AND UGM/M3
(3436)  C*****
(3437)        DENSO4=DENA
(3438)        DENNO3=DENA
(3439)        DENCOR=DENC
(3440)        WAVE = 0.53
(3441)        WV2 = (1./WAVE)**2
```

Exhibit B-1 (Continued)

```
      SUBROUTINE INRAD

(3442)        WV4 = WV2*WV2
(3443)        TAR0IZ = 0.008569*WV4*(1. +0.0113*WV2+0.00013*WV4)*EXP(-ELEV/HR)
(3444)        RAY = TAR0IZ/HR
(3445)        IF(INTYP.EQ.2) GO TO 500
(3446)        IF(INTYP.NE.1) RETURN
(3447)        DO 460 I = 1,39
(3448)        XB = BTAS04(I)*(AMBS04/DENS04 + AMBN03/DENN03)
(3449)        X9 = BTACOR(I)*CORAMB/DENCOR
(3450)        BTAAER(I) = (XB+X9)*1.E-03
(3451)        IF(BTAAER(I).NE.0.) GO TO 458
(3452)        XB=0.
(3453)        X9=0.
(3454)        GO TO 459
(3455)   458  CONTINUE
(3456)        XB=XB/(XB+X9)
(3457)        X9=1.-XB
(3458)   459  CONTINUE
(3459)        DO 460 J = 1,NTHETA
(3460)   460  PAER(I,J)=PS04(I,J)*XB+PCOR(I,J)*X9
(3461)        SIGKOS = RAY + BTAAER(19) + ABSN02(19)*AMBN02
(3462)        RVAMB = -ALOG(.02)/SIGKOS
(3463)        GO TO 600
(3464)   500 CONTINUE
(3465)  C*****
(3466)  C***  DETERMINE THE MASS OF THE ACCULATION MODE
(3467)  C*****
(3468)        SIGKOS = -ALOG(.02)/RVAMB
(3469)        SIGINT = BTACOR(19)*CORAMB*1.E-03/DENC + RAY + ABSN02(19)*AMBN02
(3470)        IF(SIGKOS-SIGINT) 100,100,120
(3471)   100 AMBS04 = 0.
(3472)        CORAMB = (SIGKOS-RAY-ABSN02(19)*AMBN02)/(BTACOR(19)*1.E-03/DENC)
(3473)        IF(CORAMB.LT.0.) PRINT 2000
(3474)  2000 FORMAT(1H ,44HTROUBLE WITH THE CONCENTRATION SPECIFICATION)
(3475)        GO TO 150
(3476)   120 AMBS04 = (SIGKOS - SIGINT)/(BTAS04(19)*1.E-03/DENS)
(3477)   150 CONTINUE
(3478)        DO 160 I = 1,39
(3479)        XB = BTAS04(I)*AMBS04*1.E-03/DENS
(3480)        X9 = BTACOR(I)*CORAMB*1.E-03/DENC
(3481)        BTAAER(I) = XB + X9
(3482)        XB = XB/(XB + X9)
(3483)        DO 160 J = 1,NTHETA
(3484)   160 PAER(I,J) = PS04(I,J)*XB + (1.-XB)*PCOR(I,J)
(3485)        AMBN03 = 0.
(3486)   600 CONTINUE
(3487)  C*****
(3488)  C***  COMPUTE THE VERTICAL AND HORIZONTAL OPTICAL DEPTHS
(3489)  C*****
(3490)        DO 200 I = 1,39
(3491)        WAVE = 0.36 + FLOAT(I)*0.01
(3492)        WV2 = WAVE**(-2)
(3493)        WV4 = WV2*WV2
(3494)        TAR0IZ = 0.008569*WV4*(1. + 0.0113*WV2 + 0.00013*WV4)*EXP(-ELEV/
(3495)       1HR)
(3496)        TAA0IZ = BTAAER(I)*HA
(3497)        TAT0IZ(I) = TAR0IZ + TAA0IZ
```

Exhibit B-1 (Continued)

```
      SUBROUTINE INRAD

(3498)          TARHIZ = TAR0IZ*EXP(-HPBL/HR)
(3499)          TAR0HZ = TAR0IZ - TARHIZ
(3500)          TAAHIZ = TAA0IZ*EXP(-HPBL/HA)
(3501)          TATHIZ(I) = TARHIZ + TAAHIZ
(3502)          TAT0HZ(I) = TAT0IZ(I) - TATHIZ(I)
(3503)          BETA0R = TAR0IZ/HR
(3504)          BTABAC(I) = BTAAER(I) + BETA0R + ABSNO2(I)*AMBNO2
(3505)          X1(I) =  TARHIZ/TATHIZ(I)
(3506)          X2(I) = TAR0HZ/TAT0HZ(I)
(3507)    C     COMPUTE THE HORIZONTAL PATH DEPTH
(3508)          TAUR0I = BETA0R*PARMR
(3509)          TAUA0I = BTAAER(I)*PARMA
(3510)          TAUR0D = BETA0R*ERF(DR)*PARMR
(3511)          TAUA0D = BTAAEP(I)*ERF(DA)*PARMA
(3512)          TAURDI = TAUR0I - TAUR0D
(3513)          TAUADI = TAUA0I - TAUA0D
(3514)          TAUT0D(I) = TAUR0D + TAUA0D
(3515)          TAUTDI(I) = TAURDI + TAUADI
(3516)          XHDI(I) = TAURDI/(TAURDI + TAUADI)
(3517)          XH0D(I) = TAUR0D/(TAUR0D + TAUA0D)
(3518)    C***  ADJEST THE OPTICAL DEPTH FOR NO2
(3519)          TAA0HZ = TAA0IZ - TAAHIZ
(3520)          TAT0IZ(I) = TAR0IZ + TAA0IZ + ABSNO2(I)*AMBNO2*HPBL
(3521)          TAT0HZ(I) = TAT0IZ(I) - TATHIZ(I)
(3522)          TAUT0D(I) = TAUR0D + TAUA0D + ABSNO2(I)*AMBNO2*DX
(3523)          OMZ(I) = (TAR0HZ + TAA0HZ)/TAT0HZ(I)
(3524)          OMH(I) = (TAUR0D + TAUA0D)/TAUT0D(I)
(3525)    C*****
(3526)    C***  CHANGE THE SCATTERING COEFICIENTS FROM BSCAT/VOL TO BSCAT/MASS
(3527)    C***
(3528)          BTAS04(I) = BTAS04(I)*1.E-03/DENS04
(3529)          BTAPRM(I) = BTAPRM(I)*1.E-03/DENP
(3530)          BTACOR(I) = BTACOR(I)*1.E-03/DENC
(3531)      200 CONTINUE
(3532)          RETURN
(3533)          END
```

Exhibit B-1 (Continued)

SUBROUTINE RAYREF(ZENITH,BETA,THETA,ITHETA,SPECR)

```
(3534)          SUBROUTINE RAYREF(ZENITH,BETA,THETA,ITHETA,SPECR)
(3535)    C
(3536)    C  CALCULATE SPECTRAL RADIANCE OF CLEAR SKY IN A RAYLEIGH ATMOSPHERE.
(3537)    C
(3538)          COMMON/BCKGND/ ELEV,RVAMB,ACCAMB,AMBNO2,RH,ROVA,ROVC,ROVS,ROVP,
(3539)         1SIGA,SIGC,SIGS,SIGP,HPBL
(3540)          COMMON / MISC / ABSNO2(39),SOLAR(39),RAD, FORPIN
(3541)          DIMENSION SPECR(39)
(3542)          TWOPI = .5/FORPIN
(3543)          RHO = .3
(3544)          RHOPI = 0.5*RHO*TWOPI
(3545)          XMU0 = COS(RAD*ZENITH)
(3546)          XMU = SIN(RAD*BETA)
(3547)          PRAY = 0.75*(1.+COS(RAD*THETA)**2)
(3548)          HR = 9.8
(3549)          CONR = SQRT(2.*6356.*HR)
(3550)          SQRTPI = SQRT(3.1415962)
(3551)          PARMR = CONR*SQRTPI*0.5
(3552)          DX = SQRT(2.*6356.*HPBL)
(3553)          DR = DX/CONR
(3554)          DO 50 I = 1,39
(3555)          WAVE = 0.36 + FLOAT(I)*0.01
(3556)          WV2 = WAVE**(-2.)
(3557)          WV4 = WV2*WV2
(3558)          TAR0IZ = 0.008569*WV4*(1. + 0.0113*WV2 + 0.00013*WV4)*EXP(-ELEV/
(3559)         1HR)
(3560)          TARHIZ = TAR0IZ*EXP(-HPBL/HR)
(3561)          TAR0HZ = TAR0IZ - TARHIZ
(3562)          FD0 = SOLAR(I)*EXP(-TAR0IZ/XMU0)
(3563)          FDH = SOLAR(I)*EXP(-TARHIZ/XMU0)
(3564)          FDAV = (FD0 + FDH)*0.5
(3565)          IF(BETA.EQ.0.) GO TO 100
(3566)          SKY = FORPIN*PRAY*(1.-EXP(-TARHIZ/XMU))*SOLAR(I)
(3567)          SURF = SKY*EXP(-TAR0HZ/XMU) + FORPIN*PRAY*(1.-EXP(-TAR0HZ
(3568)         1/XMU0))*FDAV
(3569)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAR0IZ/XMU0)*(1.-RHO))*(1.-EXP
(3570)         1(-TAR0IZ/XMU))
(3571)          DIFUSE = DIFUSE/(TWOPI-REOPI)
(3572)          SPECR(I) = SURF + DIFUSE
(3573)          GO TO 50
(3574)      100 CONTINUE
(3575)          BETA0R = TAR0IZ/HR
(3576)          TAUR0I = BETA0R*PARMR
(3577)          TAUR0D = BETA0R*ERF(DR)*PARMR
(3578)          TAURDI = TAUR0I - TAUR0D
(3579)          SKYH = FORPIN*PRAY*(1.-EXP(-TAURDI))*SOLAR(I)
(3580)          SURFH = SKYH*EXP(-TAUR0D) + FORPIN*PRAY*(1.-EXP(-TAUR0D))
(3581)         1*FDAV
(3582)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAR0IZ/XMU0)*(1.-RHO))*(1.-EXP
(3583)         1(-TAUR0I))
(3584)          DIFUSE = DIFUSE/(TWOPI-RHOPI)
(3585)          SPECR(I) = SURFH + DIFUSE
(3586)       50 CONTINUE
(3587)          RETURN
(3588)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE BACCLN(ZENITH,BETA,THETA,ITHETA,SPECB)
```

```
(3589)          SUBROUTINE BACCLN(ZENITH,BETA,THETA,ITHETA,SPECB)
(3590)    C
(3591)    C     CALCULATE SPECTRAL RADIANCE OF CLEAR SKY OF GIVEN BACKGROUND ATMOS-
(3592)    C     PHERE WITH NO2 AND FINE AND COARSE AEROSOL.
(3593)    C
(3594)          COMMON/RADPRP/BTAS04(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(3595)         1PAER(39,27),PPRIM(39,27),PS04(39,27),PCOR(39,27),BTABAC(39)
(3596)          COMMON/ OPTDEP / TAT0IZ(39),TATHIZ(39),TAT0HZ(39),X1(39),
(3597)         1X2(39),TAUTDI(39),TAUT0D(39),XHDI(39),XH0D(39)
(3598)          COMMON/ MISC/ ABSN02(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3599)         1,NTHETA
(3600)          DIMENSION SPECB(39)
(3601)          TWOPI = 0.5/FORPIN
(3602)          RHO = .3
(3603)          RHOPI = 0.5*RHO*TWOPI
(3604)          XMU0 = COS(RAD*ZENITH)
(3605)          XMU = SIN(RAD*BETA)
(3606)          PRAY = 0.75*(1.+COS(RAD*THETA)**2)
(3607)          IF(BETA.EQ.0.) GO TO 100
(3608)          DO 50 I = 1,39
(3609)          FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3610)          FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3611)          FDAV = (FD0 + FDH)*0.5
(3612)          PTOTDI = X1(I)*PRAY + (1.-X1(I))*PAER(I,ITHETA)
(3613)          PTOT0D = X2(I)*PRAY + (1. - X2(I))*PAER(I,ITHETA)
(3614)          PTOT0D = PTOT0D*OMZ(I)
(3615)          SKY = FORPIN*PTOTDI*(1.-EXP(-TATHIZ(I)/XMU))*SOLAR(I)
(3616)          SURF = SKY*EXP(-TAT0HZ(I)/XMU) + FORPIN*PTOT0D*(1.-EXP(-TAT0HZ(I
(3617)         1)/XMU))*FDAV
(3618)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0HZ(I)/XMU0)*(1.-RHO))*(1.-
(3619)         1EXP(-TAT0IZ(I)/XMU))
(3620)          DIFUSE = DIFUSE*OMZ(I)/(TWOPI-RHOPI)
(3621)          SPECB(I) = SURF + DIFUSE
(3622)       50 CONTINUE
(3623)          RETURN
(3624)      100 CONTINUE
(3625)    C*****
(3626)    C***   DO THE HORIZONTAL CASE
(3627)    C*****
(3628)          DO 75 I = 1,39
(3629)          FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3630)          FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3631)          FDAV = (FD0 + FDH)*0.5
(3632)          PTOTDI = PRAY*XHDI(I) + (1.-XHDI(I))*PAER(I,ITHETA)
(3633)          PTOT0D = XH0D(I)*PRAY + (1.-XH0D(I))*PAER(I,ITHETA)
(3634)          PTOT0D = PTOT0D*OMH(I)
(3635)          SKYH = FORPIN*PTOTDI*(1.-EXP(-TAUTDI(I)))*SOLAR(I)
(3636)          SURFH = SKYH*EXP(-TAUT0D(I)) + FORPIN*PTOT0D*(1.-EXP(-TAUT0D(I)))
(3637)         1*FDAV
(3638)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))*(1.-
(3639)         1EXP(-(TAUT0D(I)+TAUTDI(I))))
(3640)          DIFUSE = DIFUSE*OMH(I)/(TWOPI-RHOPI)
(3641)          SPECB(I) = SURFH + DIFUSE
(3642)       75 CONTINUE
(3643)          RETURN
(3644)          END
```

Exhibit B-1 (Continued)

SUBROUTINE BACOBJ(ZENITH,BETA,THETA,ITHETA,RO,SPECO,XLUMIN)

```
(3645)          SUBROUTINE BACOBJ(ZENITH,BETA,THETA,ITHETA,RO,SPECO,XLUMIN)
(3646)    C
(3647)    C     CALCULATE SPECTRAL RADIANCE OF VIEWING BACKGROUNDS OF SPECIFIED
(3648)    C     REFLECTANCE AS VIEWED THROUGH BACKGROUND ATMOSPHERE.
(3649)    C
(3650)          COMMON/RADPRP/BTAS04(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(3651)         1PAER(39,27),PPRIM(39,27),PS04(39,27),PCOR(39,27),BTABAC(39)
(3652)          COMMON/ OPTDEP / TAT0IZ(39),TATHIZ(39),TAT0HZ(39),X1(39),
(3653)         1X2(39),TAUTDI(39),TAUT0D(39),XHDI(39),XH0D(39)
(3654)          COMMON/ MISC/ ABSN02(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3655)         1,NTHETA
(3656)          DIMENSION SPECO(39)
(3657)          TWOPI = .5/FORPIN
(3658)          RHO = .3
(3659)          RHOPI = 0.5*RHO*TWOPI
(3660)          XMU0 = COS(RAD*ZENITH)
(3661)          XMU = SIN(RAD*BETA)
(3662)          PRAY = 0.75*(1.+COS(RAD*THETA)**2)
(3663)          DO 50 I = 1,39
(3664)          FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3665)          FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3666)          FDAV = (FD0 + FDH)*0.5
(3667)          PTOT0D = XH0D(I)*PRAY + (1.-XH0D(I))*PAER(I,ITHETA)
(3668)          PTOT0D = PTOT0D*OMH(I)
(3669)          TRO = EXP(-BTABAC(I)*RO)
(3670)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))*(1.-
(3671)         1TRO)
(3672)          DIFUSE = DIFUSE*OMH(I)/(TWOPI-RHOPI)
(3673)          SPECO(I) = XLUMIN*FDH*TRO + FORPIN*PTOT0D*(1.-TRO)*FDAV
(3674)          SPECO(I) = SPECO(I) + DIFUSE
(3675)       50 CONTINUE
(3676)          RETURN
(3677)          END
```

Exhibit B-1 (Continued)

SUBROUTINE PLMCLN(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,

```
(3678)          SUBROUTINE PLMCLN(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,
(3679)         1PLUMEN,SPECB,SPECP,RP,THICK)
(3680)    C
(3681)    C   CALCULATE SPECTRAL RADIANCES OF THE CLEAR SKY VIEWED WITH LINES
(3682)    C   OF SIGHT THROUGH THE PLUME AND BACKGROUND ATMOSPHERE.
(3683)    C
(3684)          COMMON/RADPRP/BTAS04(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(3685)         1PAER(39,27),PPRIM(39,27),PS04(39,27),PCOR(39,27),BTABAC(39)
(3686)          COMMON/ OPTDEP / TAT0IZ(39),TATHIZ(39),TAT0HZ(39),X1(39),
(3687)        . 1X2(39),TAUTDI(39),TAUT0D(39),XHDI(39),XH0D(39)
(3688)          COMMON/ MISC/ ABSN02(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3689)         1,NTHETA
(3690)          DIMENSION SPECB(39),SPECP(39)
(3691)          TWOPI = 0.5/FORPIN
(3692)          RHO = .3
(3693)          RHOPI = 0.5*RHO*TWOPI
(3694)          XMU0 = COS(RAD*ZENITH)
(3695)          XMU = SIN(RAD*BETA)
(3696)          PRAY = 0.75*(1.+COS(RAD*THETA)**2)
(3697)          IF(BETA.EQ.0.) GO TO 100
(3698)          DO 50 I = 1,39
(3699)          FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3700)          FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3701)          FDAV = (FD0 + FDH)*0.5
(3702)          PTOTDI = X1(I)*PRAY + (1.-X1(I))*PAER(I,ITHETA)
(3703)          PTOT0D = X2(I)*PRAY + (1. - X2(I))*PAER(I,ITHETA)
(3704)          PTOT0D = PTOT0D*OMZ(I)
(3705)          SKY = FORPIN*PTOTDI*(1.-EXP(-TATHIZ(I)/XMU))*SOLAR(I)
(3706)          SURF = SKY*EXP(-TAT0HZ(I)/XMU) + FORPIN*PTOT0D*(1.-EXP(-TAT0HZ(I
(3707)         1)/XMU))*FDAV
(3708)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))*(1.-
(3709)         1EXP(-TAT0IZ(I)/XMU))
(3710)          DIFUSE = DIFUSE*OMZ(I)/(TWOPI-RHOPI)
(3711)          SPECB(I) = SURF + DIFUSE
(3712)       50 CONTINUE
(3713)          GO TO 200
(3714)      100 CONTINUE
(3715)    C*****
(3716)    C***   DO THE HORIZONTAL CASE
(3717)    C*****
(3718)          DO 75 I = 1,39
(3719)          FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3720)          FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3721)          FDAV = (FD0 + FDH)*0.5
(3722)          PTOTDI = PRAY*XHDI(I) + (1.-XHDI(I))*PAER(I,ITHETA)
(3723)          PTOT0D = XH0D(I)*PRAY + (1.-XH0D(I))*PAER(I,ITHETA)
(3724)           PTOT0D = PTOT0D*OMH(I)
(3725)          SKYH = FORPIN*PTOTDI*(1.-EXP(-TAUTDI(I)))*SOLAR(I)
(3726)          SURFH = SKYH*EXP(-TAUT0D(I)) + FORPIN*PTOT0D*(1.-EXP(-TAUT0D(I)))
(3727)         1*FDAV
(3728)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))*(1.-
(3729)         1EXP(-(TAUT0D(I)+TAUTDI(I))))
(3730)          DIFUSE = DIFUSE*OMH(I)/(TWOPI-RHOPI)
(3731)          SPECP(I) = SURFH + DIFUSE
(3732)       75 CONTINUE
(3733)      200 CONTINUE
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMCLN(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,

(3734)          DO 250 I = 1,39
(3735)    C*****
(3736)    C***  COMPUTE THE PLUME TRANSMISSION
(3737)    C*****
(3738)          FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3739)          FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3740)          FDAV = (FD0+FDH)*.5
(3741)          TAUP1 = BTABAC(I)*RP
(3742)          TAPS04 = BTAS04(I)*PLUMES
(3743)          TAPN02 = ABSN02(I)*PLUMEN
(3744)          TAPRIM = BTAPRM(I)*PLUMEP
(3745)          TAUP2    = TAPS04 + TAPN02 + TAPRIM
(3746)          IF(I.EQ.19) THICK=TAUP2
(3747)          TAPTOT = TAUP1 + TAUP2
(3748)          XD2 = TAPS04/(TAPS04 + TAPRIM)
(3749)          OMEGAP = 1. - TAPN02/TAUP2
(3750)          PTOTPL = XD2*PS04(I,ITHETA) + (1.-XD2)*PPRIM(I,ITHETA)
(3751)          TP1 = EXP(-TAUP1)
(3752)          TP2 = EXP(-TAUP2)
(3753)          TPTOT = EXP(-TAPTOT)
(3754)          PTOT0D = XH0D(I)*PRAY + (1.-XH0D(I))*PAER(I,ITHETA)
(3755)          PTOT0D = PTOT0D*OMH(I)
(3756)          DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))
(3757)          DIFTP1 = DIFUSE*(1.-TP1)*OMH(I)/(TWOPI-RHOPI)
(3758)          SPECBR=(SPECB(I)-FORPIN*(1.-TP1)*PTOT0D*FDAV-DIFTP1)/TP1
(3759)          PL1 = SPECBR*TP2 + OMEGAP*FORPIN*PTOTPL*FDAV*(1.-TP2)
(3760)          SPECP(I) = PL1*TP1 + FORPIN*PTOT0D*(1.-TP1)*FDAV
(3761)          DIFUSE = DIFUSE*(OMH(I)*(1.-TP1)+OMEGAP*(1.-TP2)*TP1)
(3762)          DIFUSE = DIFUSE/(TWOPI-RHOPI)
(3763)          SPECP(I)=SPECP(I)+DIFUSE
(3764)      250 CONTINUE
(3765)          RETURN
(3766)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMOBJ(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,PLUMEN,
(3767)        SUBROUTINE PLMOBJ(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,PLUMEN,
(3768)       1XLUMIN,RO,RP,SPECO,SPECP)
(3769)  C
(3770)  C    CALCULATE SPECTRAL RADIANCE OF A VIEWED OBJECT OF GIVEN REFLECTANCE
(3771)  C    FOR LINES OF SIGHT THROUGH PLUME AND BACKGROUND ATMOSPHERE.
(3772)  C
(3773)        COMMON/RADPRP/BTAS04(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(3774)       1PAER(39,27),PPRIM(39,27),PS04(39,27),PCOR(39,27),BTABAC(39)
(3775)        COMMON/ OPTDEP / TAT0IZ(39),TATHIZ(39),TAT0HZ(39),X1(39),
(3776)       1X2(39),TAUTDI(39),TAUT0D(39),XHDI(39),XH0D(39)
(3777)        COMMON/ MISC/ ABSN02(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3778)       1,NTHETA
(3779)        DIMENSION SPECP(39),SPECO(39)
(3780)        TWOPI = .5/FORPIN
(3781)        RHO = .3
(3782)        RHOPI = 0.5*RHO*TWOPI
(3783)        XMU0 = COS(RAD*ZENITH)
(3784)        XMU = SIN(RAD*BETA)
(3785)        PRAY = 0.75*(1.+COS(RAD*THETA)**2)
(3786)        DO 50 I = 1,39
(3787)        FD0 = SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(3788)        FDH = SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(3789)        FDAV = (FD0 + FDH)*0.5
(3790)        PTOT0D = XH0D(I)*PRAY + (1.-XH0D(I))*PAER(I,ITHETA)
(3791)        PTOT0D = PTOT0D*OMH(I)
(3792)        TRO = EXP(-BTABAC(I)*RO)
(3793)        DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))*(1.-
(3794)       1TRO)
(3795)        DIFUSE = DIFUSE*OMH(I)/(TWOPI-RHOPI)
(3796)        SPECO(I) = XLUMIN*FDAV*TRO + FORPIN*PTOT0D*(1.-TRO)*FDAV
(3797)        SPECO(I) = SPECO(I) + DIFUSE
(3798)  C*****
(3799)  C***  COMPUTE THE PLUME TRANSMISSION
(3800)  C*****
(3801)        TAUP1 = BTABAC(I)*RP
(3802)        TAPS04 = BTAS04(I)*PLUMES
(3803)        TAPN02 = ABSN02(I)*PLUMEN
(3804)        TAPRIM = BTAPRM(I)*PLUMEP
(3805)        TAUP2    = TAPS04 + TAPN02 + TAPRIM
(3806)        TAUP3 = BTABAC(I)*(RO-RP)
(3807)        TAPTOT = TAUP1 + TAUP2
(3808)        XD2 = TAPS04/(TAPS04 + TAPRIM)
(3809)        OMEGAP = 1. - TAPN02/TAUP2
(3810)        PTOTPL = XD2*PS04(I,ITHETA) + (1.-XD2)*PPRIM(I,ITHETA)
(3811)        TP1 = EXP(-TAUP1)
(3812)        TP2 = EXP(-TAUP2)
(3813)        TPTOT = EXP(-TAPTOT)
(3814)        TP3 = EXP(-TAUP3)
(3815)        PTOT0D = XH0D(I)*PRAY + (1.-XH0D(I))*PAER(I,ITHETA)
(3816)        PTOT0D = PTOT0D*OMH(I)
(3817)        PL2 = XLUMIN*FDAV*TP3 + FORPIN*PTOT0D*FDAV*(1.-TP3)
(3818)        PL1 =       PL2*TP2 + OMEGAP*FORPIN*PTOTPL*FDAV*(1.-TP2)
(3819)        SPECP(I) = PL1*TP1 + FORPIN*PTOT0D*(1.-TP1)*FDAV
(3820)        DIFUSE = XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))
(3821)        DIFUSE=DIFUSE*(OMH(I)*(1.-TP1)+OMEGAP*(1.-TP2)*TP1+OMH(I)*
(3822)       1  (1.-TP3)*TP1*TP2)
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMOBJ(ZENITH,BETA,THETA,ITHETA,PLUMEP,PLUMES,PLUMEN,

(3823)          DIFUSE = DIFUSE/(TWOPI-RHOPI)
(3824)          SPECP(I)=SPECP(I)+DIFUSE
(3825)       50 CONTINUE
(3826)          RETURN
(3827)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE BSIZE

(3828)          SUBROUTINE BSIZE
(3829)    C
(3830)    C     CALCULATE OPTICAL PROPERTIES OF A GIVEN LOG-NORMAL AEROSOL SIZE
(3831)    C     DISTRIBUTION BASED ON MIE SCATTERING THEORY
(3832)    C
(3833)          COMMON/MIESCT/RVM,SIGMA,NLAMB,LAMB(20),JX,IT,TT(200),DUM(20),
(3834)         1PDUM(20,200)
(3835)          COMMON/ MISC/ ABSNO2(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39)
(3836)         1 ,NTHETA
(3837)          REAL LAMB
(3838)          REAL RFR,RFI,QEXT,QSCAT,QRPRD,ELTRMX(4,27,2),
(3839)         1 PIE(3,27),TAU(3,27),CSTHT(27),SI2THT(27)
(3840)          DIMENSION TT1(27)
(3841)          COMPLEX ACAP(7000)
(3842)          DIMENSION S1(27),S2(27),PHASE(27)
(3843)          DIMENSION XNT(200),ST(200),VT(200),R(100),DR(200)
(3844)          RFR = 1.5
(3845)          RFI = 0.
(3846)          PI = 3.14159267
(3847)          TWOPI = 2.*3.14159267
(3848)           FTPIN = 3./(4.*PI)
(3849)          PIN = .75
(3850)       50 NPOINT = 15
(3851)          K = NPOINT
(3852)          ITWKP1 = 2*K + 1
(3853)          KP1 = K + 1
(3854)          KP2 = K + 2
(3855)          ALSIGM = ALOG(SIGMA)
(3856)          ALSGM2 = ALSIGM**2
(3857)          SIGM2 = ALSGM2
(3858)          SQRT2 = SQRT(2.)
(3859)          RSM = EXP(ALOG(RVM)-ALSGM2)
(3860)          RNM = EXP(ALOG(RVM)-3.*ALSGM2)
(3861)          TA = 2.*ALSGM2
(3862)          CN = 1./(SQRT(TWOPI)*ALSIGM)
(3863)          CS = PI*CN*RNM**2*EXP(TA)
(3864)          CV = (4./3.)*PI*CN*RNM**3*EXP(4.5*ALSGM2)
(3865)          F1 = ALOG(30.*SQRT2*ALSIGM)
(3866)          F1 = F1/15.
(3867)          F1 = EXP(-F1)
(3868)          AA = ALOG(1./F1)
(3869)          F2 = 1./F1
(3870)          V1 = 1.
(3871)          V2 = 1.
(3872)          DO 20 I = 1,K
(3873)          V1 = V1*F1
(3874)          R(I) = RSM*V1
(3875)          ST(I) = ALGN(ALSGM2,RSM,R(I))*CS
(3876)          VT(I) = ALGN(ALSGM2,RVM,R(I))*CV
(3877)          XNT(I) = ALGN(ALSGM2,RNM,R(I))*CN
(3878)       20 DR(I) = AA
(3879)          R(KP1) = RSM
(3880)          ST(KP1) = ALGN(SIGM2, RSM,RSM)*CS
(3881)          VT(KP1) = ALGN(SIGM2,RVM,RSM)*CV
(3882)          XNT(KP1) = ALGN(SIGM2,RNM,RSM)*CN
(3883)          DR(KP1) = AA
```

Exhibit B-1 (Continued)

```
      SUBROUTINE BSIZE

(3884)          DO 21 I = KP2,ITWKP1
(3885)          V2 = V2*F2
(3886)          R(I) = RSM*V2
(3887)          ST(I) = ALGN(SIGM2,RSM,R(I))*CS
(3888)          VT(I) = ALGN(SIGM2,RVM,R(I))*CV
(3889)          DR(I) = AA
(3890)       21 XNT(I) = ALGN(SIGM2,RNM,R(I))*CN
(3891)    C     DO THE INTEGRATION OVER THE DISTRIBUTIONS
(3892)          XNTOT = 0.
(3893)          STOT = 0.
(3894)          VTOT = 0.
(3895)          DO 30 I = 1,ITWKP1
(3896)          VTOT = VTOT + VT(I)*DR(I)
(3897)          STOT = STOT + ST(I)*DR(I)
(3898)          XNTOT = XNTOT + XNT(I)*DR(I)
(3899)       30 CONTINUE
(3900)     1000 FORMAT(1H ,10X,10E10.4)
(3901)      500 CONTINUE
(3902)          NT=NTHETA
(3903)          JX=NTHETA
(3904)          IT=27
(3905)          DO 570 J=1,NTHETA
(3906)          IF(TT(J).LE.90.) GO TO 560
(3907)          TT1(J)=180.-TT(J)
(3908)          GO TO 570
(3909)      560 CONTINUE
(3910)          TT1(J)=TT(J)
(3911)      570 CONTINUE
(3912)          DO 40 IL = 1,NLAMB
(3913)          XLAM = LAMB(IL)
(3914)          WAVE = TWOPI/XLAM
(3915)          EXT = 0.
(3916)          SCAT = 0.
(3917)          ABS = 0.
(3918)          LL = 7000
(3919)          DO 31 J = 1,NT
(3920)          S1(J) = 0.
(3921)       31 S2(J) = 0.
(3922)          DO 35 I = 1,ITWKP1
(3923)          AL = WAVE*R(I)
(3924)          CALL DAMIE(AL,RFR,RFI,TT1,JX,QEXT,QSCAT,QRPRD,ELTRMX,PIE,TAU,
(3925)         1 CSTHT,S12THT,ACAP,IT,LL)
(3926)          EXT = QEXT*ST(I)*DR(I) + EXT
(3927)          SCAT = QSCAT*ST(I)*DR(I) +  SCAT
(3928)          ABS = (QEXT-QSCAT)*ST(I)*DR(I) + ABS
(3929)          DO 35 J=1,JX
(3930)          IF(TT(J).NE.TT1(J)) GO TO 365
(3931)          S1(J) = S1(J) + ELTRMX(1,J,1)*XNT(I)*DR(I)
(3932)       33 S2(J) = S2(J) + ELTRMX(2,J,1)*XNT(I)*DR(I)
(3933)          GO TO 35
(3934)      365 CONTINUE
(3935)          JJ=J
(3936)          S1(JJ) = S1(JJ) + ELTRMX(1,J,2)*XNT(I)*DR(I)
(3937)       34 S2(JJ) = S2(JJ) + ELTRMX(2,J,2)*XNT(I)*DR(I)
(3938)       35 CONTINUE
(3939)    C      PRINT OUT THE RESULTS
```

Exhibit B-1 (Continued)

```
      SUBROUTINE BSIZE

(3940)          CS = XLAM**2/(PI*SCAT)
(3941)          DUM(IL) = EXT/VTOT
(3942)          DO 36 I = 1,NT
(3943)          PDUM(IL,I) = 0.5*(S1(I)+S2(I))*CS
(3944)       36 PHASE(I) = 0.5*(S1(I)+S2(I))*CS
(3945)       40 CONTINUE
(3946)          RETURN
(3947)          END
```

Exhibit B-1 (Continued)

```
      FUNCTION ALGN(X,Y,Z)

(3948)          FUNCTION ALGN(X,Y,Z)
(3949)          TWOX = 2.*X
(3950)          U = (ALOG(Y/Z))**2
(3951)          ALGN = EXP(-U/TWOX)
(3952)          RETURN
(3953)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE SOLARZ(SLA,SLO,TZ,IY,IM,ID,TIME,D,NV)
```

```
(3954)         SUBROUTINE SOLARZ(SLA,SLO,TZ,IY,IM,ID,TIME,D,NV)
(3955)   C***
(3956)   C***      SLA...  LATITUDE (DEG)  SOUTH = MINUS
(3957)   C***      SLO...  LONGITUDE (DEG)  EAST = MINUS
(3958)   C***      TZ...  TIME ZONE
(3959)   C***              ALSO INCLUDES FRACTION IF LOCAL TIME IS NOT
(3960)   C***               STANDARD MERIDIAN TIME.  E.G. POONA, INDIA 5.5
(3961)   C***      IY..  YEAR
(3962)   C***      IM..  MONTH
(3963)   C***      ID..  DAY
(3964)   C***      TIME.. LOCAL STANDARD TIME IN HOURS AND MINUTES.
(3965)   C***               1 30 PM = 1330  ** STANDARD TIME **
(3966)   C***      D..  RETURNED VALUE
(3967)   C***      NV..  VALUE TO BE RETURNED, SELECTED AS FOLLOWS....
(3968)   C***              1...  DECLINATION (DEG.)
(3969)   C***              2...  EQUATION OF TIME ADJUSTMENT (HRS.)
(3970)   C***              3...  TRUE SOLAR TIME (HRS.)
(3971)   C***              4...  HOUR ANGLE (DEG.)
(3972)   C***              5...  SOLAR ELEVATION (DEG.)
(3973)   C***              6...  OPTICAL AIRMASS
(3974)   C***      0 ( NV ( 7.  OTHERWISE, D = 9999.
(3975)   C***
(3976)         COMMON /SOL/ EFFDEC, HRANGL
(3977)         DIMENSION MD(11)
(3978)         DOUBLE PRECISION RAD,SDEC
(3979)         DATA MD/31,29,31,30,31,30,2*31,30,31,30/
(3980)         DATA A,B,C,SIGA/0.15,3.885,1.253,279.9348/
(3981)         RAD=572957.75913E-4
(3982)         SDEC=39784.988432E-5
(3983)         RE=1.
(3984)         IF (SLO.LT.0.) RE=-1.
(3985)         KZ=TZ
(3986)         TC=(TZ-FLOAT(KZ))*RE
(3987)         TZZ=FLOAT(KZ)*RE
(3988)         SLB=SLA/RAD
(3989)         K=ID
(3990)         TIMH=TIME/100.
(3991)         I=TIMH
(3992)         TIMLOC=(TIMH-FLOAT(I))/0.6+FLOAT(I)+TC
(3993)         IMC=IM-1
(3994)         IF (IMC.LT.1) GO TO 10
(3995)         DO 5 I=1,IMC
(3996)       5 K=K+MD(I)
(3997)      10 LEAP=1
(3998)         NL=MOD(IY,4)
(3999)         IF (NL.LT.1) LEAP=2
(4000)         SMER=TZZ*15.
(4001)         TK=((SMER-SLO)*4.)/60.
(4002)         KR=1
(4003)         IF (K.GE.61.AND.LEAP.LT.2) KR=2
(4004)         DAD=(TIMLOC+TZZ)/24.
(4005)         DAD=DAD+FLOAT(K)-FLOAT(KR)
(4006)         DF=DAD*360./365.242
(4007)         DE=DF/RAD
(4008)         DESIN=SIN(DE)
(4009)         DECOS=COS(DE)
```

Exhibit B-1 (Continued)

```
      SUBROUTINE SOLARZ(SLA,SLO,TZ,IY,IM,ID,TIME,D,NV)

(4010)          DESIN2=SIN(DE*2.)
(4011)          DECOS2=COS(DE*2.)
(4012)          SIG=SIGA+DF+1.914827*DESIN-0.079525*DECOS+0.019938*DESIN2-0.00162*
(4013)         1DECOS2
(4014)          SIG=SIG/RAD
(4015)          DECSIN=SDEC*SIN(SIG)
(4016)          EFFDEC=ASIN(DECSIN)
(4017)          IF (NV.NE.1) GO TO 15
(4018)          D=EFFDEC*RAD
(4019)          RETURN
(4020)       15 EQT=0.12357*DESIN-0.004289*DECOS+0.153809*DESIN2+0.060783*DECOS2
(4021)          IF (NV.NE.2) GO TO 20
(4022)          D=EQT
(4023)          RETURN
(4024)       20 TST=TK+TIMLOC-EQT
(4025)          IF (NV.NE.3) GO TO 25
(4026)          D=TST
(4027)          IF (D.LT.0.) D=D+24.
(4028)          IF (D.GE.24.) D=D-24.
(4029)          RETURN
(4030)       25 HRANGL=ABS(TST-12.)*15.
(4031)          IF (NV.NE.4) GO TO 30
(4032)          D=HRANGL
(4033)          RETURN
(4034)       30 HRANGL=HRANGL/RAD
(4035)          SOLSIN=DECSIN*SIN(SLB)+COS(EFFDEC)*COS(SLB)*COS(HRANGL)
(4036)          SOLEL=ASIN(SOLSIN)*RAD
(4037)          IF (NV.NE.5) GO TO 35
(4038)          D=SOLEL
(4039)          RETURN
(4040)       35 IF (NV.NE.6) GO TO 40
(4041)          IF (SOLEL.LE.0.) GO TO 40
(4042)          TK=SOLEL+B
(4043)          E=1./TK**C
(4044)          D=1./(A*E+SOLSIN)
(4045)          RETURN
(4046)       40 D=9999.
(4047)          RETURN
(4048)          END
```

Exhibit B-1 (Continued)

SUBROUTINE SPLNA (N,X,Y,J,D,C,W)

```
(4049)          SUBROUTINE SPLNA (N,X,Y,J,D,C,W)
(4050)          DIMENSION X(10), Y(10), D(2), C(30), W(30)
(4051)    C     ------------------------------------------------------------------
(4052)    C             OVER THE INTERVAL X(I) TO X(I+1), THE INTERPOLATING
(4053)    C             POLYNOMIAL
(4054)    C                  Y=Y(I)+A(I)*Z+B(I)*Z**2+E(I)*Z**3
(4055)    C             WHERE Z=(X-X(I))/(X(I+1)-X(I))
(4056)    C             IS USED. THE COEFFICIENTS A(I),B(I) AND E(I) ARE COMPUTED
(4057)    C             BY SPLNA AND STORED IN LOCATIONS C(3*I-2),C(3*I-1) AND
(4058)    C             C(3*I) RESPECTIVELY.
(4059)    C             WHILE WORKING IN THE ITH INTERVAL,THE VARIABLE Q WILL
(4060)    C             REPRESENT Q=X(I+1) - X(I), AND Y(I) WILL REPRESENT
(4061)    C             Y(I+1)-Y(I)
(4062)    C     ------------------------------------------------------------------
(4063)    C
(4064)          Q=X(2)-X(1)
(4065)          YI=Y(2)-Y(1)
(4066)          IF (J.EQ.2) GO TO 5
(4067)    C     ------------------------------------------------------------------
(4068)    C             IF THE FIRST DERIVATIVE AT THE END POINTS IS GIVEN,
(4069)    C             A(1) IS KNOWN, AND THE SECOND EQUATION BECOMES
(4070)    C             MERELY B(1)+E(1)=YI - Q*D(1).
(4071)    C     ------------------------------------------------------------------
(4072)          C(1)=Q*D(1)
(4073)          C(2)=1.0
(4074)          W(2)=YI-C(1)
(4075)          GO TO 10
(4076)    C     ------------------------------------------------------------------
(4077)    C             IF THE SECOND DERIVATIVE AT THE END POINTS IS GIVEN
(4078)    C             B(1) IS KNOWN, THE SECOND EQUATION BECOMES
(4079)    C             A(1)+E(1)=YI-0.5*Q*Q*D(1). DURING THE SOLUTION OF
(4080)    C             THE 3N-4 EQUATIONS,A1 WILL BE KEPT IN CELL C(2)
(4081)    C             INSTEAD OF C(1) TO RETAIN THE TRIDIAGONAL FORM OF THE
(4082)    C             COEFFICIENT MATRIX.
(4083)    C     ------------------------------------------------------------------
(4084)        5 C(2)=0.0
(4085)          W(2)=0.5*Q*Q*D(1)
(4086)       10 M=N-2
(4087)          IF (M.LE.0) GO TO 20
(4088)    C     ------------------------------------------------------------------
(4089)    C             UPPER TRIANGULARIZATION OF THE TRIDIAGONAL SYSTEM OF
(4090)    C             EQUATIONS FOR THE COEFFICIENT MATRIX FOLLOWS--
(4091)    C     ------------------------------------------------------------------
(4092)          DO 15 I=1,M
(4093)          A1=Q
(4094)          Q=X(I+2)-X(I+1)
(4095)          H=A1/Q
(4096)          C(3*I)=-H/(2.0-C(3*I-1))
(4097)          W(3*I)=(-YI-W(3*I-1))/(2.0-C(3*I-1))
(4098)          C(3*I+1)=-H*H/(H-C(3*I))
(4099)          W(3*I+1)=(YI-W(3*I))/(H-C(3*I))
(4100)          YI=Y(I+2)-Y(I+1)
(4101)          C(3*I+2)=1.0/(1.0-C(3*I+1))
(4102)       15 W(3*I+2)=(YI-W(3*I+1))/(1.0-C(3*I+1))
(4103)    C     ------------------------------------------------------------------
(4104)    C             E(N-1) IS DETERMINED DIRECTLY FROM THE LAST EQUATION
```

Exhibit B-1 (Continued)

```
      SUBROUTINE SPLNA (N,X,Y,J,D,C,W)

(4103)  C             OBTAINED ABOVE, AND THE FIRST OR SECOND DERIVATIVE
(4106)  C             VALUE GIVEN AT THE END POINT.
(4107)  C     ------------------------------------------------------------------
(4108)       20 IF (J.EQ.1) GO TO 25
(4109)          C(3*N-3)=(Q*Q*D(2)/2.0-W(3*N-4))/(3.0-C(3*N-4))
(4110)          GO TO 30
(4111)       25 C(3*N-3)=(Q*D(2)-Y1-W(3*N-4))/(2.0-C(3*N-4))
(4112)       30 M=3*N-6
(4113)          IF (M.LE.0) GO TO 40
(4114)  C     ------------------------------------------------------------------
(4115)  C             BACK SOLUTION FOR ALL COEFFICENTS EXCEPT
(4116)  C             A(1) AND B(1) FOLLOWS--
(4117)  C     ------------------------------------------------------------------
(4118)          DO 35 II=1,M
(4119)          I=M-II+3
(4120)       35 C(I)=W(I)-C(I)*C(I+1)
(4121)       40 IF (J.EQ.1) GO TO 45
(4122)  C     ------------------------------------------------------------------
(4123)  C             IF THE SECOND DERIVATIVE IS GIVEN AT THE END POINTS,
(4124)  C             A(1) CAN NOW BE COMPUTED FROM THE KNOWN VALUES OF
(4125)  C             B(1) AND E(1). THEN A(1) AND B(1) ARE PUT INTO THEIR
(4126)  C             PROPER PLACES IN THE C ARRAY.
(4127)  C     ------------------------------------------------------------------
(4128)          C(1)=Y(2)-Y(1)-W(2)-C(3)
(4129)          C(2)=W(2)
(4130)          RETURN
(4131)       45 C(2)=W(2)-C(3)
(4132)          RETURN
(4133)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE MAPCTU (ALON,ALAT,IZONE,UTMX,UTMY)
```

```
(4134)          SUBROUTINE MAPCTU (ALON,ALAT,IZONE,UTMX,UTMY)
(4135)    C
(4136)    C     *** CONVERTS LATITUDE AND LONGITUDE TO UTM COORDINATES
(4137)    C         THIS IS A MODIFICATION OF THE US GEOLOGICAL SURVEY
(4138)    C         PROGRAM NO J3B0 (TOPOGRAPHIC DIVISION)
(4139)    C             GW LUNDBERG/SAI  APR 79
(4140)    C
(4141)    C         ALON     LONGITUDE IN DEGREES (WESTERN HEMISPHERE IS NEGATIVE)
(4142)    C         ALAT     LATITUDE IN DEGREES
(4143)    C         IZONE    ZONE OVERRIDE IF NOT ZERO
(4144)    C         UTMX     EASTING (KM)
(4145)    C         UTMY     NORTHING (KM)
(4146)    C
(4147)          DIMENSION B(12)
(4148)          COMMON /VVUTM/ A(16)
(4149)    C
(4150)          SLAT = ALAT*3600.
(4151)          SLON = -ALON*3600.
(4152)    C
(4153)    C     *** COMPUTE COEFFICIENTS FOR CONVERSION
(4154)          CALL VVGTU1
(4155)    C
(4156)    C     *** TEST FOR ZONE INPUT ON GEODETIC TO UTM INDICATING OVERRIDE OF
(4157)    C         NORMAL 6 DEGREE LONGITUDE BAND.
(4158)    C
(4159)          IF(IZONE.EQ.0)GO TO 30
(4160)    C
(4161)    C     *** COMPUTE CENTRAL MERIDIAM IN SECONDS FOR ENFORCED ZONE.
(4162)          IF(IABS(IZONE)-30)10,10,20
(4163)       10 UTZ=30.0-FLOAT(IABS(IZONE))
(4164)          A(9)=((UTZ*6.0)+3.0)*3600.0
(4165)          GO TO 40
(4166)       20 UTZ=FLOAT(IABS(IZONE))-30.0
(4167)          A(9)=((UTZ*6.0)-3.0)*(-3600.0)
(4168)          GO TO 40
(4169)    C
(4170)    C     *** COMPUTE UTM ZONE(IZONE) AND CENTRAL MERIDIAN IN SECONDS(A9)
(4171)    C         FOR GEODETIC TO UTM CONVERSION WHERE ZONE IS NOT INPUT.
(4172)    C
(4173)       30 IZONE=30-(INT(SLON)/21600)
(4174)          UTZ=30.0-FLOAT(IZONE)
(4175)          A(9)=((UTZ*6.0)+3.0)*3600.0
(4176)    C
(4177)    C     *** CONVERT GEODETIC TO UTM COORDINATES
(4178)    C
(4179)    C     *** RETURNS ZEROS IF LATITUDE EXCEEDS 84 DEGREES OR LONGITUDE
(4180)    C         0.16 RADIANS
(4181)       40 IF(ABS(SLAT)-302400.0) 80,80,70
(4182)       70 X=0.0
(4183)          Y=0.0
(4184)          GO TO 99
(4185)       80 B(10)=(A(9)-SLON) *4.848181109536E-6
(4186)          IF(ABS(B(10))-0.16)90,90,70
(4187)       90 B(9)=SLAT*4.848136811095E-6
(4188)          SINP=SIN(B(9))
(4189)          COSP=COS(B(9))
```

Exhibit B-1 (Continued)

```
      SUBROUTINE MAPGTU (ALON,ALAT,IZONE,UTMX,UTMY)

(4190)          RN=A(15)/SQRT(1.0-A(16)*SINP*SINP)
(4191)          T=SINP/COSP
(4192)          TS=T*T
(4193)          B(11)=COSP*COSP
(4194)          ETAS=A(16)*B(11)/(1.0-A(16))
(4195)          B(1)=RN*COSP
(4196)          B(3)=(1.0-TS+ETAS)*B(1)*B(11)/6.0
(4197)          B(5)=((TS-18.0)*TS+5.0+(14.0-58.0*TS)*ETAS)*B(1)*B(11)*
(4198)         1 B(11)/120.0
(4199)          B(7)=(((179.0-TS)*TS-479.0)*TS+61.0)*B(1)*B(11)**3/5040.0
(4200)          B(12)=B(10)*B(10)
(4201)          X=(((B(7)*B(12)+B(5))*B(12)+B(3))*B(12)+B(1))*B(10)*A(8)+
(4202)         1   A(5)
(4203)          B(2)=RN*B(11)*T/2.0
(4204)          B(4)=(ETAS*(9.0+4.0*ETAS)+5.0-TS)*B(2)*B(11)/12.0
(4205)          B(6)=((TS-58.0)*TS+61.0+(270.0-330.0*TS)*ETAS)*B(2)*
(4206)         1 B(11)*B(11)/360.0
(4207)          B(8)=(((543.0-TS)*TS-3111.0)*TS+1385.0)*B(2)*B(11)**3/
(4208)         1 20160.0
(4209)          Y=((((B(8)*B(12)+B(6))*B(12)+B(4))*B(12)+B(2))*B(12)+
(4210)         1 ((((A(4)*B(11)+A(3))*B(11)+A(2))*B(11)+A(1))*SINP*COSP+B(9))
(4211)         1 *A(10)
(4212)          Y=(Y-A(7))*A(8)+A(6)
(4213)    C
(4214)       99 UTMX = X/1000.
(4215)          UTMY = Y/1000.
(4216)          RETURN
(4217)          END
```

Exhibit B-1 (Continued)

SUBROUTINE VVGTU1

```
(4218)          SUBROUTINE VVGTU1
(4219)    C
(4220)    C     *** SETS UP COEFFICIENTS FOR CONVERTING GEODETIC TO
(4221)    C         RECTIFYING LATITUDE AND CONVERSELY
(4222)    C
(4223)    C           A1-A4 COEFFICIENTS FOR CONVERTING GEODITIC TO RECTIFYING LATIT
(4224)    C           A5     FALSE EASTING
(4225)    C           A6     FALSE NORTHING
(4226)    C           A8     SCALE FACTOR AT CENTRAL MERIDIAN
(4227)    C           A9     CENTRAL MERIDIAN IN SECONDS
(4228)    C           A10    RADIUS OF SPHERE HAVING GREAT CIRCLE LENGTH EQUAL TO
(4229)    C                  SPHEROID MERIDIAN LENGTH
(4230)    C           A11-A14  COEFFICIENTS FOR CONVERTING RECTIFYING LATITUDE TO
(4231)    C                    GEODETIC LATITUDE
(4232)    C           A15    SEMIMAJOR AXIS OF SPHERIOD
(4233)    C           A16    ECCENTRICITY SQUARED
(4234)    C
(4235)    C
(4236)          COMMON /VVUTM/ A(16)
(4237)          DATA IFRST/1/
(4238)    C
(4239)    C     *** COMPUTE COEFFICIENTS ON FIRST PASS ONLY
(4240)          IF (IFRST .NE. 1) RETURN
(4241)          IFRST = 0
(4242)    C
(4243)          A(5)=5.0E5
(4244)          A(6)=0.0
(4245)          A(7)=0.0
(4246)          A(8)=0.9996
(4247)    C
(4248)    C     *** CLARKE 1866 ELLIPSOID AXES LENGTHS
(4249)          A(15)=6378206.4
(4250)          B = 6356583.80
(4251)    C
(4252)          A(16)= ((A(15)-B)/A(15))*((A(15)+B)/A(15))
(4253)          A(10)=(((A(16)*(7.0/3.2E1)+(5.0/1.6E1))*A(16)+0.5)*A(16)
(4254)         1 +1.0)*A(16)*0.25
(4255)          A(1)=-(((A(10)*(1.95E2/6.4E1)+3.25)*A(10)+3.75)*A(10)+3.0)*
(4256)         1 A(10)
(4257)          A(2)=(((1.455E3/3.2E1)*A(10)+(7.0E1/3.0))*A(10)+7.5)*A(10)**2
(4258)          A(3)=-((7.0E1/3.0)+A(10)*(9.45E2/8.0))*A(10)**3
(4259)          A(4)=(3.15E2/4.0)*A(10)**4
(4260)          A(11)=(((7.75-(6.57E2/6.4E1)*A(10))*A(10)-5.25)*A(10)+3.0)*
(4261)         1 A(10)
(4262)          A(12)=(((5.045E3/3.2E1)*A(10)-(1.51E2/3.0))*A(10)+10.5)*
(4263)         1 A(10)**2
(4264)          A(13)=((1.51E2/3.0)-(3.291E3/8.0)*A(10))*A(10)**3
(4265)          A(14)=(1.097E3/4.0)*A(10)**4
(4266)          FAC=A(10)*A(10)
(4267)          A(10)=(((2.25E2/6.4E1)*FAC+2.25)*FAC+1.0)*(1.0-FAC)*
(4268)         1 (1.0-A(10))*A(15)
(4269)          RETURN
(4270)          END
```

Exhibit B-1 (Continued)

28 27

SUBROUTINE MAPUTG (UTMX,UTMY,IZONE,ALON,ALAT)

```
(4271)          SUBROUTINE MAPUTG (UTMX,UTMY,IZONE,ALON,ALAT)
(4272)    C
(4273)    C     *** CONVERTS UTM COORDINATES TO LATITUDE AND LONGITUDE
(4274)    C         THIS IS A MODIFICATION OF THE US GEOLOGICAL SURVEY
(4275)    C         PROGRAM NO J380  (TOPOGRAPHIC DIVISION)
(4276)    C             GW LUNDBERG/SAI  APR 79
(4277)    C
(4278)    C         UTMX     EASTING IN KILOMETERS
(4279)    C         UTMY     NORTHING IN KILOMETERS
(4280)    C         IZONE    UTM ZONE NUMBER
(4281)    C         ALON     LONGITUDE IN DEGREES
(4282)    C         ALAT     LATITUDE IN DEGREES
(4283)    C
(4284)          DIMENSION B(12)
(4285)          COMMON /VVUTM/ A(16)
(4286)    C
(4287)          X = UTMX*1000.
(4288)          Y = UTMY*1000.
(4289)    C
(4290)    C     *** COMPUTE CONVERSION COEFFICIENTS IF NEEDED
(4291)          CALL VVGTU1
(4292)    C
(4293)    C     *** COMPUTE CENTRAL MERIDIAN IN SECONDS FROM IZONE INPUT
(4294)       10 UTZ = 30.0 - FLOAT(IABS (IZONE))
(4295)          A(9) = ((UTZ*6.0) + 3.0) * 3600.0
(4296)    C
(4297)    C     *** CONVERT UTM COORDINATES TO GEODETIC
(4298)          B(9)=((A(5)-X)*1.0E-6)/A(8)
(4299)          IF (ABS(B(9))-1.0E-7*A(15)*2.0)30,30,20
(4300)       20 SLAT=0.0
(4301)          SLON=0.0
(4302)          GO TO 99
(4303)       30 B(10)=((Y-A(6))/A(8)+A(7))/A(10)
(4304)          IF(ABS(B(10))-1.47E0)40,40,20
(4305)       40 SINW=SIN(B(10))
(4306)          COSW=COS(B(10))
(4307)          B(12)=COSW*COSW
(4308)          B(11)=(((A(14)*B(12)+A(13))*B(12)+A(12))*B(12)+A(11))*SINW*COSW
(4309)         1 +B(10)
(4310)          SINW=SIN(B(11))
(4311)          COSW=COS(B(11))
(4312)          RN=SQRT(1.0-A(16)*SINW*SINW)*1.0E6/A(15)
(4313)          T=SINW/COSW
(4314)          TS=T*T
(4315)          B(12)=COSW*COSW
(4316)          ETAS=A(16)*B(12)/(1.0-A(16))
(4317)          B(1)=RN/COSW
(4318)          B(2)=-T*(1.0+ETAS)*RN*RN/2.0
(4319)          B(3)=-(1.0+2.0*TS+ETAS)*B(1)*RN*RN/6.0
(4320)          B(4)=(((-6.0-ETAS*9.0)*ETAS+3.0)*TS+(6.0-ETAS*3.0)*ETAS
(4321)         1 +5.0)*T*RN**4/24.0
(4322)          B(5)=((TS*24.0+ETAS*8.0+28.0)*TS+ETAS*6.0+5.0)*B(1)*
(4323)         1 RN**4/120.0
(4324)          B(6)=(((ETAS*45.0-45.0)*TS+ETAS*162.0-90.0)*TS
(4325)         1 -ETAS*107.0-61.0)*T*RN**6/720.0
(4326)          B(7)=-(((TS*720.0+1320.0)*TS+662.0)*TS+61.0)*B(1)*RN**6/
```

Exhibit B-1 (Continued)

```
      SUBROUTINE MAPUTG (UTMX,UTMY,IZONE,ALON,ALAT)

(4327)         1 5040.0
(4328)          B(8)=(((TS*1575.0+4095.0)*TS+3633.0)*TS+1385.0)*T*RN**8/
(4329)         1 40320.0
(4330)          B(10)=B(9)*B(9)
(4331)          SLAT=((((B(8)*B(10)+B(6))*B(10)+B(4))*B(10)+B(2))*B(10)+B(11))*
(4332)         1 206264.80624709
(4333)          SLON= (((B(7)*B(10)+B(5))*B(10)+B(3))*B(10)+B(1))*B(9)*
(4334)         1 206264.80624709 + A(9)
(4335)   C
(4336)   C       *** CONVERT SECONDS OF ARC TO DEGREES AND RETURN
(4337)        99 ALAT = SLAT/3600.
(4338)           ALON = -SLON/3600.
(4339)   C
(4340)           RETURN
(4341)           END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE DAMIE (X,RFR,RFI,THETD,JX,QEXT,QSCAT,CTBRQS,ELTRMX,
```

```
(4342)          SUBROUTINE DAMIE (X,RFR,RFI,THETD,JX,QEXT,QSCAT,CTBRQS,ELTRMX,
(4343)         1 PI,TAU,CSTHT,S12THT,ACAP,IT,LL)
(4344)   C       LARGE VERSION
(4345)   C       SUBROUTINE FOR COMPUTING THE PARAMETERS OF THE ELECTROMAGNETIC
(4346)   C       RADIATION SCATTERED BY A SPHERE. THIS SUBROUTINE CARRIES OUT ALL
(4347)   C       COMPUTATIONS IN DOUBLE PRECISION ARITHMETIC.
(4348)   C       THIS SUBROUTINE COMPUTES THE CAPITAL A FUNCTION BY MAKING USE OF
(4349)   C       DOWNWARD RECURRENCE RELATIONSHIP.
(4350)   C       X! SIZE PARAMETER OF THE SPHERE,( 2 * PI * RADIUS OF THE SPHERE)
(4351)   C       WAVELENGTH OF THE INCIDENT RADIATION).
(4352)   C       RF! REFRACTIVE INDEX OF THE MATERIAL OF THE SPHERE.  COMPLEX
(4353)   C       QUANTITY..FORM! (R.I - I * RFI )
(4354)   C       THETD(J)! ANGLE IN DEGREES BETWEEN THE DIRECTIONS OF THE INCIDENT
(4355)   C       AND THE SCATTERED RADIATION.  THETD(J) IS< OR= 90.0
(4356)   C       IF THETD(J) SHOULD HAPPEN TO BE GREATER THAN 90.0, ENTER WITH
(4357)   C       SUPPLEMENTARY VALUE
(4358)   CSEE COMMENTS BELOW ON ELTRMX.
(4359)   C       JX! TOTAL NUMBER OF THETD FOR WHICH THE COMPUTATIONS ARE
(4360)   C       REQUIRED.  JX SHOULD NOT EXCEED IT UNLESS THE DIMENSIONS
(4361)   C       STATEMENTS ARE APPROPRIATEDLY MODIFIED.
(4362)   C       MAIN PROGRAM SHOULD ALSO HAVE REAL*8 THETD(IT ),ELTRMX(4,IT ,2).
(4363)   C       THE DEFINITIONS FOR THE FOLLOWING SYMBOLS CAN BE FOUND IN        LIGHT
(4364)          REAL    X,RX,RFR,RFI,QEXT,QSCAT,T(5),TA(4),TB(2),TC(2)
(4365)          REAL    TD(2),TE(2),CTBRQS
(4366)          REAL    ELTRMX(4,IT ,2) PI(3,IT ),TAU(3,IT ),CSTHT(IT ),S12THT(IT)
(4367)         1 ,THETD(IT)
(4368)          COMPLEX     RF,RRF,RRFX,WM1,FNA,FNB,TC1,TC2,WFN(2)
(4369)          COMPLEX     FNAP,FNBP,ACAP(1)
(4370)   C       IN THE ORIGINAL PROGRAM THE DIMENSION OF ACAP WAS 7000.
(4371)   C       FOR CONSERVING SPACE THIS SHOULD BE NOT MUCH HIGHER THAN
(4372)   C       THE VALUE, N=1.1*(NREAL**2 + NIMAG**2)**.5 * X + 1
(4373)   C       TA(1)! REAL PART OF WFN(1).. TA(2)! IMAGINARY PART OF WFN(1)..
(4374)   C       TA(3)! REAL PART OF WFN(2)..TA(4)! IMAGINARY PART OF WFN(2).
(4375)   C       TB(1)! REAL PART OF FNA.. TB(2)! IMAGINARTY PART OF FNA..
(4376)   C       TC(1)! REAL PART OF FNB.. TC(2)! IMAGINARY PART OF FNB..
(4377)   C       TD(1)! REAL PART OF FNAP..TD(2) IMAGINARY PART OF FNAP.
(4378)   C       TE(1)! REAL PART OF FNBP.. TE(2)! IMAGINARY PART OF FNBP.
(4379)   C      FNAP ? FNBP ARE THE PRECEDING VALUES OF FNA ? FNB RESPECTIVELY.
(4380)   C****  PRIME VERSION WORKS ONLY IN SINGLE PRECISION WITH THE
(4381)   C      COMPLEX ARITHMETIC.
(4382)          EQUIVALENCE (WFN(1),TA(1)),(FNA,TB(1)),(FNB,TC(1))
(4383)          EQUIVALENCE(FNAP,TD(1)),(FNBP,TE(1))
(4384)          DATA PII /3.1415926535897932/
(4385)   C
(4386)   C      FORMAT STATEMENTS FOLLOW
(4387)    5      FORMAT(10X,' THE VALUE OF THE SCATTERING ANGLE IS GREATER THAN
(4388)          1 90.0 DEGREES. IT IS ',E15.4)
(4389)    6      FORMAT(//10X, 'PLEASE READ COMMENTS.' //)
(4390)    7      FORMAT(//10X,'THE VALUE OF THE ARGUMENT JX IS GREATER THAN IT ')
(4391)    8      FORMAT(//10X,'THE UPPER LIMIT FOR ACAP IS NOT ENOUGH. SUGGEST GET
(4392)          1 DETAILED OUPUT AND MODIFY SUBROUTINE'//)
(4393)   C
(4394)   C      EXECUTABLE STATEMENTS FOLLOW
(4395)          IF(JX.LE. IT) GO TO 20
(4396)          WRITE(6,7)
(4397)          WRITE(6,6)
```

Exhibit B-1 (Continued)

```
      SUBROUTINE DANIE (X,RFR,RFI,THETD,JX,QEXT,QSCAT,CTBBQS,ELTRMX,
(4398)            CALL EXIT
(4399)     20     RF =  CMPLX(RFR,-RFI)
(4400)            RRF = 1.0E0/RF
(4401)            RX = 1.0E0/X
(4402)            RRFX = RRF * RX
(4403)            T(1) = (X**2)*(RFR**2 + RFI**2)
(4404)            T(1) =  SQRT(T(1))
(4405)            NMX1 = 1.10E0 * T(1)
(4406)     C      WRITE(6,199) X,RFR,RFI,LL,NMX1
(4407)     C 199 FORMAT(1H ,'X=',E14.6,2X,'RFR=',E14.6,2X,'RFI=',E14.6,2X,'LL=',I10
(4408)     C     1,2X,*NMX1                                          *,I10)
(4409)            IF( NMX1 .LE. LL-1 ) GO TO 21
(4410)            WRITE(6,8)
(4411)            STOP
(4412)     21     NMX2 = T(1)
(4413)            IF( NMX1 .GT. 150) GO TO 22
(4414)            NMX1 = 150
(4415)            NMX2 = 135
(4416)     22     ACAP(NMX1 + 1 ) = (0.0E0,0.0E0)
(4417)            DO 23 N = 1,NMX1
(4418)            NN = NMX1 - N + 1
(4419)            ACAP(NN)=FLOAT(NN+1)*RRFX-1.0E0/(FLOAT(NN+1)*RRFX+ACAP(NN+1))
(4420)     23     CONTINUE
(4421)            DO 30 J = 1,JX
(4422)            IF ( THETD(J) .LT. 0.0E0 ) THETD(J) =  ABS(THETD(J))
(4423)            IF ( THETD(J) .GT. 0.0E0 ) GO TO 24
(4424)            CSTHT(J) = 1.0E0
(4425)            SI2THT(J) = 0.0E0
(4426)            GO TO 30
(4427)     24     IF ( THETD(J) .GE. 90.0E0) GO TO 25
(4428)            T(1) = ( PII * THETD(J))/180.0E0
(4429)            CSTHT(J) =  COS(T(1))
(4430)            SI2THT(J) = 1.0E0 - CSTHT(J)**2
(4431)            GO TO 30
(4432)     25     IF ( THETD(J) .GT. 90.0E0) GO TO 28
(4433)            CSTHT(J) = 0.0E0
(4434)            SI2THT(J) = 1.0E0
(4435)            GO TO 30
(4436)     28     WRITE(6,5) THETD(J)
(4437)            WRITE(6,6)
(4438)            CALL EXIT
(4439)     30     CONTINUE
(4440)            DO 35 J = 1,JX
(4441)            PI(1,J) = 0.0E0
(4442)            PI(2,J) = 1.0E0
(4443)            TAU(1,J) = 0.0E0
(4444)            TAU(2,J) = CSTHT(J)
(4445)     35     CONTINUE
(4446)            T(1) =  COS(X)
(4447)            T(2) =  SIN(X)
(4448)            WM1 =  CMPLX( T(1),-T(2))
(4449)            WFN(1) =  CMPLX(T(2),T(1))
(4450)            WFN(2) = RX * WFN(1) - WM1
(4451)            TC1 = ACAP(1) * RRF + RX
(4452)            TC2 = ACAP(1) * RF + RX
(4453)            FNA = (TC1*TA(3) - TA(1))/(TC1*WFN(2) - WFN(1))
```

Exhibit B-1 (Continued)

```
SUBROUTINE DAMIE (X,RFR,RFI,THETD,JX,QEXT,QSCAT,CTBRQS,ELTRMX,

      FNB = ( TC2*TA(3) - TA(1))/(TC2  * WFN(2) - WFN(1))
      FNAP = FNA
      FNBP = FNB
      T(1) = 1.50E0
C     FROM HERE TO THE STATMENT NUMBER 90, ELTRMX(I,J,K) HAS
C     FOLLOWING MEANING!
C     ELTRMX(1,J,K)! REAL PART OF THE FIRST COMPLEX AMPLITUDE.
C     ELTRMX(2,J,K)! IMAGINARY PART OF THE FIRST COMPLEX AMPLITUDE.
C     ELTRMX(3,J,K)! REAL PART OF THE SECOND COMPLEX AMPLITUDE.
C     ELTRMX(4,J,K)! IMAGINARY PART OF THE SECOND COMPLEX AMPLITUDE.
C     K = 1 ! FOR THETD(J) AND K = 2 ! FOR 180.0 - THETD(J)
C     DEFINITION OF THE COMPLEX AMPLITUDE! VAN DE HULST,P.125.
      TB(1) = T(1) * TB(1)
      TB(2) = T(1) * TB(2)
      TC(1) = T(1) * TC(1)
      TC(2) = T(1) * TC(2)
      DO 60 J = 1,JX
      ELTRMX(1,J,1) = TB(1) * PI(2,J) + TC(1) * TAU(2,J)
      ELTRMX(2,J,1) = TB(2) * PI(2,J) + TC(2) * TAU(2,J)
      ELTRMX(3,J,1) = TC(1) * PI(2,J) + TB(1) * TAU(2,J)
      ELTRMX(4,J,1) = TC(2) * PI(2,J) + TB(2) * TAU(2,J)
      ELTRMX(1,J,2) = TB(1) * PI(2,J) - TC(1) * TAU(2,J)
      ELTRMX(2,J,2) = TB(2) * PI(2,J) - TC(2) * TAU(2,J)
      ELTRMX(3,J,2) = TC(1) * PI(2,J) - TB(1) * TAU(2,J)
      ELTRMX(4,J,2) = TC(2) * PI(2,J) - TB(2) * TAU(2,J)
   60 CONTINUE
      QEXT = 2.0E0 * ( TB(1) + TC(1))
C    WRITE(6,999) TB(1),TC(1)
      QSCAT =(TB(1)**2 + TB(2)**2 + TC(1)**2 + TC(2)**2)/0.75E0
      CTBRQS = 0.0E0
      N = 2
   65 T(1) = 2*N - 1
      T(2) = N - 1
      T(3) = 2 * N + 1
      DO 70 J = 1,JX
      PI(3,J) = (T(1)*PI(2,J)*CSTHT(J)-FLOAT(N)*PI(1,J))/T(2)
      TAU(3,J) = CSTHT(J)*(PI(3,J)-PI(1,J))-T(1)*SI2THT(J)*PI(2,J)+
     1 TAU(1,J)
   70 CONTINUE
      WM1 = WFN(1)
      WFN(1) = WFN(2)
      WFN(2) = T(1)*RX*WFN(1) - WM1
      TC1 = ACAP(N)*RRF + FLOAT(N)*RX
      TC2 = ACAP(N)*RF + FLOAT(N)*RX
      FNA = (TC1*TA(3)-TA(1))/(TC1*WFN(2) - WFN(1))
      TC2 = TC2
      TA(3) = TA(3)
      TA(1) = TA(1)
      TC1 = TC1
      WFN(2) = WFN(2)
      WFN(1) = WFN(1)
      FNB = (TC2*TA(3)-TA(1))/(TC2*WFN(2) - WFN(1))
      T(5) = N
      T(4) = T(1)/(T(5)*T(2))
      T(2) = (T(2)*(T(5) + 1.0E0))/T(5)
      CTBRQS = CTBRQS + T(2)*(TD(1)*TB(1) + TD(2)*TB(2) + TE(1)*TC(1) +
```

Exhibit B-1 (Continued)

```
      SUBROUTINE DAVIE (X,RFR,RFI,THETD,JX,QEXT,QSCAT,CTBRQS,ELTRMX)

     1 TE(2)*TC(2))  + T(4)*(TD(1)*TE(1) + TD(2)*TE(2))
       QEXT = QEXT + T(3)*(TB(1)+TC(1))
       T(4) = TB(1)**2 + TB(2)**2 + TC(1)**2 + TC(2)**2
       QSCAT = QSCAT + T(3) *T(4)
       T(2) = N*(N+1)
       T(1) = T(3)/T(2)
C      WRITE(6,999) T(1),QEXT
       K = (N/2)*2
       DO 80 J = 1,JX
       ELTRMX(1,J,1)=ELTRMX(1,J,1)+T(1)*(TB(1)*PI(3,J)+TC(1)*TAU(3,J))
       ELTRMX(2,J,1)=ELTRMX(2,J,1)+T(1)*(TB(2)*PI(3,J)+TC(2)*TAU(3,J))
       ELTRMX(3,J,1)=ELTRMX(3,J,1)+T(1)*(TC(1)*PI(3,J)+TB(1)*TAU(3,J))
       ELTRMX(4,J,1)=ELTRMX(4,J,1)+T(1)*(TC(2)*PI(3,J)+TB(2)*TAU(3,J))
       IF ( K .EQ. N) GO TO 75
      ELTRMX(1,J,2)=ELTRMX(1,J,2)  +T(1)*(TB(1)*PI(3,J)-TC(1)*TAU(3,J))
       ELTRMX(2,J,2)=ELTRMX(2,J,2)+T(1)*(TB(2)*PI(3,J)-TC(2)*TAU(3,J))
       ELTRMX(3,J,2)=ELTRMX(3,J,2)+T(1)*(TC(1)*PI(3,J)-TB(1)*TAU(3,J))
       ELTRMX(4,J,2)=ELTRMX(4,J,2)+T(1)*(TC(2)*PI(3,J)-TB(2)*TAU(3,J))
       GO TO 80
 75    ELTRMX(1,J,2)=ELTRMX(1,J,2)+T(1)*(-TB(1)*PI(3,J)+TC(1)*TAU(3,J))
       ELTRMX(2,J,2)=ELTRMX(2,J,2)+T(1)*(-TB(2)*PI(3,J)+TC(2)*TAU(3,J))
       ELTRMX(3,J,2)=ELTRMX(3,J,2)+T(1)*(-TC(1)*PI(3,J)+TB(1)*TAU(3,J))
       ELTRMX(4,J,2)=ELTRMX(4,J,2)+T(1)*(-TC(2)*PI(3,J)+TB(2)*TAU(3,J))
 80    CONTINUE
       IF( T(4) .LT.  1.0E-6 ) GO TO 100
       N = N + 1
       DO 90 J = 1,JX
       PI(1,J) = PI(2,J)
       PI(2,J) = PI(3,J)
       TAU(1,J) = TAU(2,J)
       TAU(2,J) = TAU(3,J)
 90    CONTINUE
       FNAP = FNA
       FNBP = FNB
       IF ( N .LE. NMX2) GO TO 65
       WRITE(6,8)
       CALL EXIT
100    DO 120 J = 1,JX
       DO 120 K = 1,2
       DO  115  I= 1,4
       T(I) = ELTRMX(I,J,K)
115    CONTINUE
       ELTRMX(2,J,K) = T(1)**2 + T(2)**2
       ELTRMX(1,J,K) = T(3)**2 + T(4)**2
       ELTRMX(3,J,K) = T(1)*T(3) + T(2)*T(4)
       ELTRMX(4,J,K) = T(2)*T(3) - T(4)*T(1)
120    CONTINUE
       T(1) = 2.0E0 * RX**2
       QEXT = QEXT * T(1)
C      WRITE(6,999) T(1),QEXT
C999    FORMAT(1H ,3E20.8)
       QSCAT = QSCAT * T(1)
       CTBRQS = 2.E0 * CTBRQS * T(1)
C      THE DETAIL ABOUT THIS SUBROUTINE CAN BE FOUND IN THE FOLLOWING
C      REPORT:                                  SUBROUTINES FOR COMPUTING THE PARAM
C      ELECTROMAGNETIC RADIATION SCATTERED BY A SPHERE                    J.V. DAVE
```

Exhibit B-1 (Continued)

```
      SUBROUTINE DAMIE (X,RFR,RFI,THETD,JX,QEXT,QSCAT,CTBRQS,ELTRMX,
(4566)  C       I B M SCIENTIFIC CENTER, PALO ALTO , CALIFORNIA.
(4567)  C       REPORT NO. 320 - 3236 .. MAY 1968 ..
(4568)  99999   RETURN
(4569)          END
```

Exhibit B-1 (Continued)

SUBROUTINE PLMAX(ZENITH,THETA,ITHETA,CPAVE,CPSAVE,CNAVE,XALONG,

```
(4570)          SUBROUTINE PLMAX(ZENITH,THETA,ITHETA,CPAVE,CPSAVE,CNAVE,XALONG,
(4571)         1 SPECP,SPECB)
(4572)    C
(4573)    C    CALCULATE THE CHANGE IN SPECTRAL RADIANCE ALONG A SEGMENT OF THE
(4574)    C    LINE OF SIGHT WITH SPECIFIED AVERAGE PLUME CONCENTRATIONS.
(4575)    C
(4576)          COMMON/RADPRP/BTAS04(39),BTACOR(39),BTAPRM(39),BTAAER(39),
(4577)         1PAER(39,27),PPRIM(39,27),PS04(39,27),PCOR(39,27),BTABAC(39)
(4578)          COMMON/OPTDEP/TAT0IZ(39),TATHIZ(39),TAT0HZ(39),X1(39),
(4579)         1X2(39),TAUTDI(39),TAUT0D(39),XHDI(39),XH0D(39)
(4580)          COMMON/MISC/ABSN02(39),SOLAR(39),RAD,FORPIN,OMZ(39),OMH(39),NTHETA
(4581)          DIMENSION SPECP(39),SPECB(39)
(4582)          TWOPI=.5/FORPIN
(4583)          RHO=.3
(4584)          RHOPI=0.5*RHO*TWOPI
(4585)          XMU0=COS(RAD*ZENITH)
(4586)          PRAY=0.75*(1.+COS(RAD*THETA)**2)
(4587)          DO 50 I=1,39
(4588)             FD0=SOLAR(I)*EXP(-TAT0IZ(I)/XMU0)
(4589)             FDH=SOLAR(I)*EXP(-TATHIZ(I)/XMU0)
(4590)             FDAV=(FD0+FDH)*0.5
(4591)             PTOT0D=XH0D(I)*PRAY+(1.-XH0D(I))*PAER(I,ITHETA)
(4592)             PTOT0D=PTOT0D*OMH(I)
(4593)    C******
(4594)    C***    COMPUTE THE PLUME TRANSMISSION
(4595)    C*****
(4596)             TAUP1=BTABAC(I)*XALONG
(4597)             TAPS04=BTAS04(I)*CPSAVE*XALONG
(4598)             TAPN02=ABSN02(I)*CNAVE*XALONG
(4599)             TAPRIM=BTAPRM(I)*CPAVE*XALONG
(4600)             TAUP2=TAPS04+TAPN02+TAPRIM
(4601)             TAPTOT=TAUP1+TAUP2
(4602)             IF((TAPS04+TAPRIM).EQ.0.0)GO TO 55
(4603)             XD2=TAPS04/(TAPS04+TAPRIM)
(4604)             GO TO 60
(4605)    55       XD2=0.0
(4606)    60       IF(TAUP2.EQ.0.0)GO TO 65
(4607)             OMEGAP=1.-TAPN02/TAUP2
(4608)             GO TO 70
(4609)    65       OMEGAP=1.
(4610)    70       PTOTPL=XD2*PS04(I,ITHETA)+(1.-XD2)*PPRIM(I,ITHETA)
(4611)             TP1=EXP(-TAUP1)
(4612)             TP2=EXP(-TAUP2)
(4613)             TPTOT=EXP(-TAPTOT)
(4614)             PTOT0D=XH0D(I)*PRAY+(1.-XH0D(I))*PAER(I,ITHETA)
(4615)             PTOT0D=PTOT0D*OMH(I)
(4616)             IF(TAPTOT.EQ.0.0)GO TO 75
(4617)             X11=TAUP2/TAPTOT
(4618)             GO TO 80
(4619)    75       X11=0.0
(4620)    80       CONTINUE
(4621)             SPECP(I)=SPECP(I)*TPTOT+X11*OMEGAP*FORPIN*PTOTPL*FDAV*(1.-TPTOT
(4622)          1  )+(1.-X11)*FORPIN*PTOT0D*FDAV*(1.-TPTOT)
(4623)             DIFUSE=XMU0*SOLAR(I)*(1.-EXP(-TAT0IZ(I)/XMU0)*(1.-RHO))
(4624)             DP=DIFUSE*(X11*OMEGAP+(1.-X11))*(1.-TPTOT)
(4625)             DP=DP/(TWOPI-RHOPI)
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMAX(ZENITH,THETA,ITHETA,CPAVE,CPSAVE,CNAVE,XALONG,

(4626)                SPECP(I)=SPECP(I)+DP
(4627)                SPECB(I)=SPECB(I)*TP1+FORPIN*PTOT0D*FDAV*(1.-TP1)+DIFUSE*(1.-
(4628)           1    TP1)/(TWOPI-RHOPI)
(4629)    50     CONTINUE
(4630)           RETURN
(4631)           END
```

Exhibit B-1 (Continued)

FUNCTION CLOCK(T1,IINC)

```
(4632)                FUNCTION CLOCK(T1,IINC)
(4633)   C
(4634)   C     ****     ADD A TIME IN MINUTES TO A 2400 HOUR TIME AND RETURN A 2400
(4635)   C     ****     HOUR TIME
(4636)   C
(4637)          T2 = IINC
(4638)          I100 = INT(T1/100.)
(4639)          T3 = T1-100.0*FLOAT(I100) + T2
(4640)          I100 = I100 + INT(T3/60.)
(4641)          CLCK=FLOAT(I100)*100.0 + T3 -60.0 * FLOAT(INT(T3/60.))
(4642)          T4=CLCK-FLOAT(IFIX(CLCK) /100)*100.
(4643)          CLOCK=CLCK
(4644)          IF(T4.GT.59.) CLOCK=CLCK-40.
(4645)          RETURN
(4646)          END
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMIN(RPR,ROR,SY,RP,YINTR)
```

```
(4647)          SUBROUTINE PLMIN(RPR,ROR,SY,RP,YINTR)
(4648)    C
(4649)    C     SUBROUTINE TO RECALCULATE PLUME CENTROID WHEN OBSERVER OR BACKGROUND
(4650)    C     OBJECT IS WITHIN THE PLUME.
(4651)    C
(4652)          YINTRF=0.5
(4653)          YINTRB=0.5
(4654)          YINTR=YINTRF+YINTRB
(4655)          IF(RPR.LT.2.17.AND.ROR.GT.2.17)GO TO 10
(4656)          IF(RPR.GT.2.17.AND.ROR.LT.2.17)GO TO 20
(4657)          IF(RPR.LT.2.17.AND.ROR.LT.2.17)GO TO 30
(4658)    C
(4659)    C     OBSERVER IN PLUME
(4660)    C
(4661)    10    RPHALF=0.18*(RPR+0.25)+0.153*(RPR+0.75)+0.167*(RPR+1.5)
(4662)          IF(RPR.GT.0.5)GO TO 11
(4663)    C
(4664)    C     OBSERVER > 1/2 SIGMA-Y FROM CENTERLINE.
(4665)    C
(4666)          YINTR1=(RPR/0.5)*0.18
(4667)          YINTRF=YINTR1
(4668)          YINTR=YINTRF+YINTRB
(4669)          RP=((RPR*YINTR1/2.+RPHALF)/YINTR)*(SY/1000.)
(4670)          GO TO 100
(4671)    11    IF(RPR.GT.1.0)GO TO 12
(4672)    C
(4673)    C     OBSERVER BETWEEN 1/2 AND 1 SIGMA-Y FROM CENTERLINE OF PLUME.
(4674)    C
(4675)          YINTR1=((RPR-0.5)/0.5)*0.153
(4676)          YINTRF=YINTR1+0.18
(4677)          YINTR=YINTRF+YINTRB
(4678)          RP=(((RPR-0.5)/2.*YINTR1+RPHALF)/YINTR)*SY/1000.
(4679)          GO TO 100
(4680)    12    YINTR1=(RPR-1.0)*0.142
(4681)    C
(4682)    C     OBSERVER BETWEEN 1 AND 2.17 SIGMA-Y FROM CENTERLINE OF PLUME.
(4683)    C
(4684)          YINTRF=YINTR1+0.18+0.153
(4685)          YINTR=YINTRF+YINTRB
(4686)          RP=(((RPR-1.)*YINTR1/2.+(RPR-0.75)*0.153+(RPR-0.25)*0.18+RPHALF
(4687)         1)/YINTR)*SY/1000.
(4688)          GO TO 100
(4689)    20    CONTINUE
(4690)    C
(4691)    C     OBSERVER OUTSIDE PLUME
(4692)    C     ADJUST RPHALF FOR OBJECT WITHIN PLUME
(4693)    C     RPFRNT FOR FRONT SIDE
(4694)    C
(4695)          RPFRNT=(RPR-0.25)*0.18+(RPR-0.75)*0.153+(RPR-1.5)*0.167
(4696)          IF(ROR.GT.0.5)GO TO 21
(4697)          YINTR1=(ROR/0.5)*0.18
(4698)          YINTRB=YINTR1
(4699)          YINTR=YINTRB+YINTRF
(4700)          RP=((RPFRNT+(RPR+ROR/2.)*YINTR1)/YINTR)*SY/1000.
(4701)          GO TO 100
(4702)    21    IF (ROR.GT.1.0)GO TO 22
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMIN(RPR,ROR,SY,RP,YINTR)

(4703)  C
(4704)  C    OBJECT BETWEEN 1/2 AND 1 SIGMA-Y FROM PLUME CENTERLINE.
(4705)  C
(4706)         YINTR1=((ROR-0.5)/0.5)*0.153
(4707)         YINTRB=YINTR1+0.18
(4708)         YINTR=YINTRF+YINTRB
(4709)         RP=((RPFRNT+(RPR+(ROR-0.5)/2.)*YINTR1+(RPR+0.25)*0.18)/YINTR)*
(4710)        1  SY/1000.
(4711)         GO TO 100
(4712)  22     CONTINUE
(4713)  C
(4714)  C    OBJECT BETWEEN 1 AND 2.17 SIGMA-Y FROM PLUME CENTERLINE.
(4715)  C
(4716)         YINTR1=(ROR-1.0)*0.142
(4717)         YINTRB=YINTR1+0.18+0.153
(4718)         YINTR=YINTRF+YINTRB
(4719)         RP=((RPFRNT+(RPR+(ROR-1.0)/2.)*YINTR1+(RPR+0.75)*0.153+(RPR+0.25)
(4720)        1 *0.18)/YINTR)*SY/1000.
(4721)         GO TO 100
(4722)  30     CONTINUE
(4723)  C
(4724)  C    BOTH OBSERVER AND OBJECT IN PLUME.
(4725)  C
(4726)         IF(RPR.GT.0.5)GO TO 35
(4727)         IF(ROR.GT.0.5)GO TO 31
(4728)  C
(4729)  C  BOTH OBSERVER AND OBJECT ARE WITHIN 0.5 SIGMA-Y OF THE PLUME CENTERLINE
(4730)  C
(4731)         YINTR1=(RPR/0.5)*0.18
(4732)         YINTR2=(ROR/0.5)*0.18
(4733)         YINTR=YINTR1+YINTR2
(4734)         RP=((RPR*YINTR1/2.+(RPR+(ROR/2.))*YINTR2)/YINTR)*SY/1000.
(4735)         GO TO 100
(4736)  31     IF(ROR.GT.1.0)GO TO 32
(4737)  C
(4738)  C    OBJECT BETWEEN 0.5 AND 1.0 SIGMA-Y FROM CENTERLINE AND
(4739)  C    OBSERVER < 0.5 SIGMA-Y FROM CENTERLINE OF PLUME.
(4740)  C
(4741)         YINTR1=(RPR/0.5)*0.18
(4742)         YINTR2=((ROR-0.5)/0.5)*0.153
(4743)         YINTRB=YINTR2+0.18
(4744)         YINTR=YINTR1+YINTRB
(4745)         RP=((RPR*YINTR1/2.+(RPR+0.5+(ROR-0.5)/2.)*YINTR2+(RPR+0.25)*0.18)
(4746)        1 /YINTR)*SY/1000.
(4747)         GO TO 100
(4748)  32     YINTR1=(RPR/0.5)*0.18
(4749)  C
(4750)  C    OBJECT BETWEEN 1.0 AND 2.17 SIGMA-Y FROM CENTERLINE AND OBSERVER
(4751)  C    < 0.5 SIGMA-Y FROM CENTERLINE.
(4752)  C
(4753)         YINTR2=(ROR-0.5)*0.142
(4754)         YINTRB=YINTR2+0.153+0.18
(4755)         YINTR=YINTR1+YINTRB
(4756)         RP=((RPR*YINTR1/2.+(RPR+1.0+(ROR-1.)/2.)*YINTR2+(RPR+0.75)*0.153
(4757)        1 +(RPR+0.25)*0.18)/YINTR)*SY/1000.
(4758)         GO TO 100
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMIN(RPR,ROR,SY,RP,YINTR)


(4759)  35     IF(RPR.GT.1.0)GO TO 40
(4760)         IF(ROR.GT.0.5)GO TO 36
(4761)  C
(4762)  C    OBJECT < 0.5 SIGMA-Y FROM CENTERLINE AND OBSERVER BETWEEN 0.5 AND
(4763)  C    1.0 SIGMA-Y FROM CENTERLINE OF PLUME.
(4764)  C
(4765)         YINTR1=((RPR-0.5)/0.5)*0.153
(4766)         YINTRF=YINTR1+0.18
(4767)         YINTR2=(ROR/0.5)*0.18
(4768)         YINTR=YINTRF+YINTR2
(4769)         RP=(((RPR-0.5)*YINTR1/2.+(RPR-0.25)*0.18+(RPR+ROR/2.)*YINTR2)
(4770)        1/YINTR)*SY/1000.
(4771)         GO TO 100
(4772)  36     IF(ROR.GT.1.0)GO TO 37
(4773)  C
(4774)  C    BOTH OBSERVER AND OBJECT BETWEEN 0.5 AND 1.0 SIGMA-Y FROM
(4775)  C    PLUME CENTERLINE.
(4776)  C
(4777)         YINTR1=((RPR-0.5)/0.5)*0.153
(4778)         YINTRF=YINTR1+0.18
(4779)         YINTR2=((ROR-0.5)/0.5)*0.153
(4780)         YINTRB=YINTR2+0.18
(4781)         YINTR=YINTRF+YINTRB
(4782)         RP=(((RPR-0.5)*YINTR1/2.+(RPR-0.25)*0.18+(RPR+0.5+(ROR-0.5)/2.)
(4783)        1 *YINTR2+(RPR+0.25)*0.18)/YINTR)*SY/1000.
(4784)         GO TO 100
(4785)  37     YINTR1=((RPR-0.5)/0.5)*0.153
(4786)  C
(4787)  C    OBSERVER BETWEEN 0.5 AND 1.0 SIGMA-Y FROM PLUME CENTERLINE AND OBJECT
(4788)  C    BETWEEN 1.0 AND 2.17 SIGMA-Y FROM PLUME CENTERLINE.
(4789)         YINTRF=YINTR1+0.18
(4790)         YINTR2=(ROR-1.0)*0.142
(4791)         YINTRB=YINTR2+0.153+0.18
(4792)         YINTR=YINTRF+YINTRB
(4793)         RP=(((RPR-0.5)*YINTR1/2.+(RPR-0.25)*0.18+(RPR+1.0+(ROR-1.)/2.)
(4794)        1 *YINTR2+(RPR+0.75)*0.153+(RPR+0.25)*0.18)/YINTR)*SY/1000.
(4795)         GO TO 100
(4796)  40     IF(ROR.GT.0.5)GO TO 41
(4797)  C
(4798)  C    OBSERVER BETWEEN 1.0 AND 2.17 SIGMA-Y FROM PLUME CENTERLINE AND
(4799)  C    OBJECT < 0.5 SY FROM PLUME CENTERLINE.
(4800)  C
(4801)         YINTR1=(RPR-1.0)*0.142
(4802)         YINTRF=YINTR1+0.18+0.153
(4803)         YINTR2=(ROR/0.5)*0.18
(4804)         YINTR=YINTRF+YINTR2
(4805)         RP=(((RPR-1.)*YINTR1/2.+(RPR-0.75)*0.153+(RPR-0.25)*0.18+(RPR+ROR/
(4806)        1 2.)*YINTR2)/YINTR)*SY/1000.
(4807)         GO TO 100
(4808)  41     IF(ROR.GT.1.0)GO TO 42
(4809)  C
(4810)  C    OBSERVER BETWEEN 1.0 AND 2.17 SIGMA-Y FROM PLUME CENTERLINE AND OBJECT
(4811)  C    BETWEEN 1.0 AND 1.5 SIGMA-Y FROM PLUME CENTERLINE.
(4812)  C
(4813)         YINTRF=YINTR1+0.18+0.153
(4814)         YINTR2=((ROR-0.5)/0.5)*0.153
```

Exhibit B-1 (Continued)

```
      SUBROUTINE PLMIN(RPR,ROR,SY,RP,YINTR)

(4815)           YINTRB=YINTR2+0.18
(4816)           YINTR=YINTRF+YINTRB
(4817)           RP=(((RPR-1.0)*YINTR1/2.+(RPR-0.75)*0.153+(RPR-0.25)*0.18+(RPR+0.5
(4818)          1 +(ROR-0.5)/2.)*YINTR2+(RPR+0.25)*0.18)/YINTR)*SY/1000.
(4819)           GO TO 100
(4820)   42      YINTR1=(RPR-1.0)*0.142
(4821)   C
(4822)   C     BOTH OBSERVER AND OBJECT BETWEEN 1.0 AND 2.17 SIGMA-Y FROM PLUME
(4823)   C     CENTERLINE.
(4824)   C
(4825)           YINTRF=YINTR1+0.18+0.153
(4826)           YINTR2=(ROR-1.0)*0.142
(4827)           YINTRB=YINTR2+0.153+0.18
(4828)           YINTR=YINTRF+YINTRB
(4829)           RP=(((RPR-1.0)*YINTR1/2.+(RPR-0.75)*0.153+(RPR-0.25)*0.18+(RPR+1.0
(4830)          1 +(ROR-1.)/2.)*YINTR2+(RPR+0.75)*0.153+(RPR+0.25)*0.18)/YINTR)*SY/
(4831)          21000.
(4832)   100     RETURN
(4833)           END
```

Exhibit B-1 (Concluded)

APPENDIX C

USER'S GUIDE TO VISPLOT: GRAPHICS OUTPUT FOR PLUVUE

The theoretical aspects of the visibility model PLUVUE are presented in the main text. This section describes the use of VISPLOT, a graphics software package that can be used in conjunction with PLUVUE. VISPLOT takes the four parameters that characterize visibility impairment (percent visual range reduction, blue-red ratio, plume contrast, and ΔE) from PLUVUE and presents them in a graphic form. VISPLOT has the capability of presenting the four parameters on a line printer or an off-line plotter. Off-line plotting requires the use of standard CALCOMP routines. VISPLOT is written in American National Standards Institute (ANSI) FORTRAN IV as defined in ANSI publication X.39-1966.

Input Card Formats

A set of five to seven cards is required as input to VISPLOT:

- Overall control card.
- Axis scaling cards (optional).
- Title card.
- Set of azimuth angles (or downwind distances).
- Set of parameter cases (numeric labels).
- Set of alphanumeric labels for each parameter case (optional).
- Wind speed, wind direction, and stability class.

The formats for each of the above cards are given in table C-1. A set of wind speed, wind direction, and stability class is required for each set of PLUVUE results. The input card deck is assigned to FORTRAN

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TABLE C-1. INPUT CARD FORMATS

Card	Column	Format	Description
Overall control	1 - 10	F10.0	Choice of line-of-sight geometry. Zero: observer-based lines of sight. Nonzero: plume-parcel-based line of sight.
	11 - 20	F10.0	CALCOMP plotting option; user must provide standard CALCOMP routines. Zero: line-printer plot only. Nonzero: line-printer and off-line plots.
	21 - 30	F10.0	Number of sets of PLUVUE results to be plotted.
	31 - 40	F10.0	Flag to keep ordinate axis at default values or to determine new axis minimum and maximum from PLUVUE results. Zero: default values. Positive nonzero: PLUVUE determined axis scales. Negative nonzero: user-input. values of ordinate axis minimums and maximums.
	41 - 50	F10.0	Number of parameter cases per plot; maximum is 8.
	51 - 60	F10.0	Alphanumeric labels flag (labels for each parameter case).
Horizontal axis maximum (optional)	1 - 10	F10.0	Input horizontal axis maximum only if plume-parcel-based line of sight is used. Default = 350 km. A zero or a blank is a default.

TABLE C-1 (continued)

Card	Column	Format	Description
Vertical axis dimension (optional)	1 - 10	8F10.0	Minimum ΔE axis value; Default = 0.0.
	11 - 20		Maximum ΔE axis value; Default = 40.0.
	21 - 30		Minimum contrast axis value; Default = - 0.6.
	31 - 40		Maximum contrast axis value; Default = 0.2.
	41 - 50		Minimum blue-red ratio; Default = 0.4.
	51 - 60		Maximum blue-red ratio; Default = 1.2.
	61 - 70		Minimum visual range reduction; Default = 0.0.
	71 - 80		Maximum visual range reduction; Default = 75.0.
			A -999. in any field will represent the use of the default values.
Title	1 - 80	80A1	Title used for the caption.
Azimuth angles (or downwind distance)	1 - 5 6 - 10 11 - 15 . . . 76 - 80	16F5.0	Azimuth angles (or downwind distances) used in the PLUVUE run; maximum of 16 values. Azimuth angles are entered if observer-based lines of sight are used; downwind distances are entered if plume-based lines of sight are used.

TABLE C-1 (concluded)

Card	Column	Format	Description
Viewing backgrounds (or wind speed cases)	1 - 5 6 - 10 11 - 15 . . . 36 - 40	8F5.0	A numeric label for the different parameter cases should be the same number of values as that entered in columns 41 - 50 of the control card.
Alphanumeric label card (optional)	1 - 12	3A4	Alphanumeric labels for each of the parameter cases above. One card for each label.
Stability class, wind speed and wind direction card*	1 - 5	F5.0	Stability class 1 = neutral, 2 = stable
	6 - 10	F5.0	Wind speed in units of meters/second.
	11 - 15	F5.0	Wind direction in degrees azimuth (from the north).

* There should be one card for each set of PLUVUE results.

unit 5. A sample input deck is shown in exhibit C-1. The optical results from PLUVUE are assigned to FORTRAN unit 7. For the plume-parcel-based, line-of-sight runs, the results of the different runs representing different parameter values can be merged into one file (locally named TAPE7). The user is referred to the main text of this user's manual for a description of these file formats. If the CALCOMP plotting option is desired, then the user must provide a set of standard CALCOMP routines; the CALCOMP routines required by VISPLOT are as follows:

```
> SUBROUTINE PLOTS (X,Y,IX)
> SUBROUTINE PLOT (X,Y,IX)
> SUBROUTINE SYMBOL (X,Y,HT,ITX,ANG,NCHR)
> SUBROUTINE NUMBER (X,Y,HT,FPN,ANG,NDEC)
> SUBROUTINE NEWPEN (IPEN)
```

For users without access to these CALCOMP routines, dummy routines may be needed in order to run the VISPLOT program. To generate the dummy routines, the user must have the following cards for each of the above routines:

```
> SUBROUTINE _______ (argument list)
> RETURN
> END
```

For users with standard CALCOMP routines, no modification of VISPLOT is required. The user should check that the five routines have the same names on his system as those listed above.

Examples of off-line and line-printer line plots are shown in exhibits C-2 and C-3, respectively, for the example input shown in exhibit C-1.

```
0.          1.          1.          0.          4.
  THIS IS A TEST PLOT
 19.6 21.1 23.6 26.1 29.7 35.7 46.5 69.3110.8143.1161.6169.8174.6177.7179.8181.4
1.    2.    3.    4.
 4.3    4.   11.3
```

Exhibit C-1. Example of an input card deck

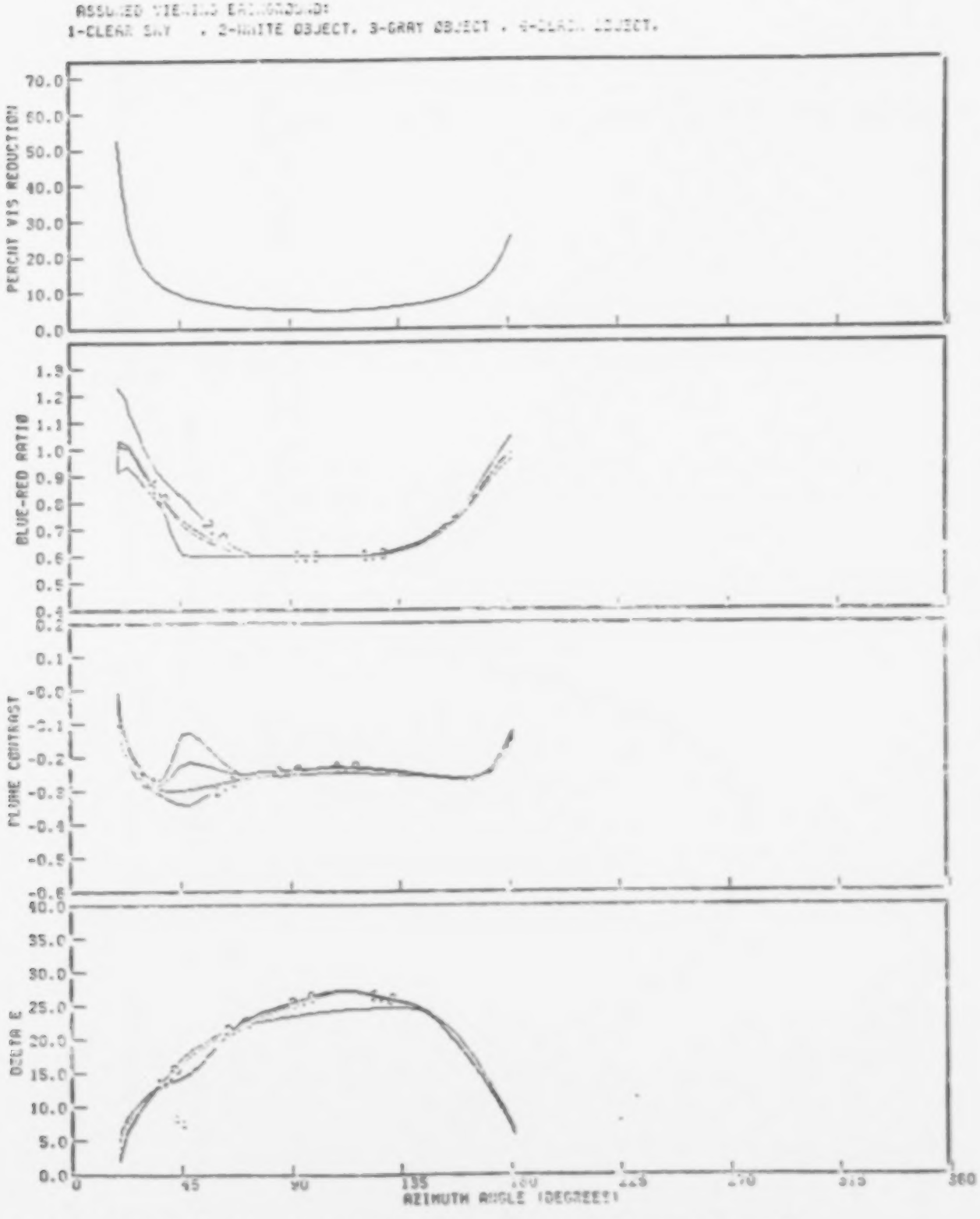
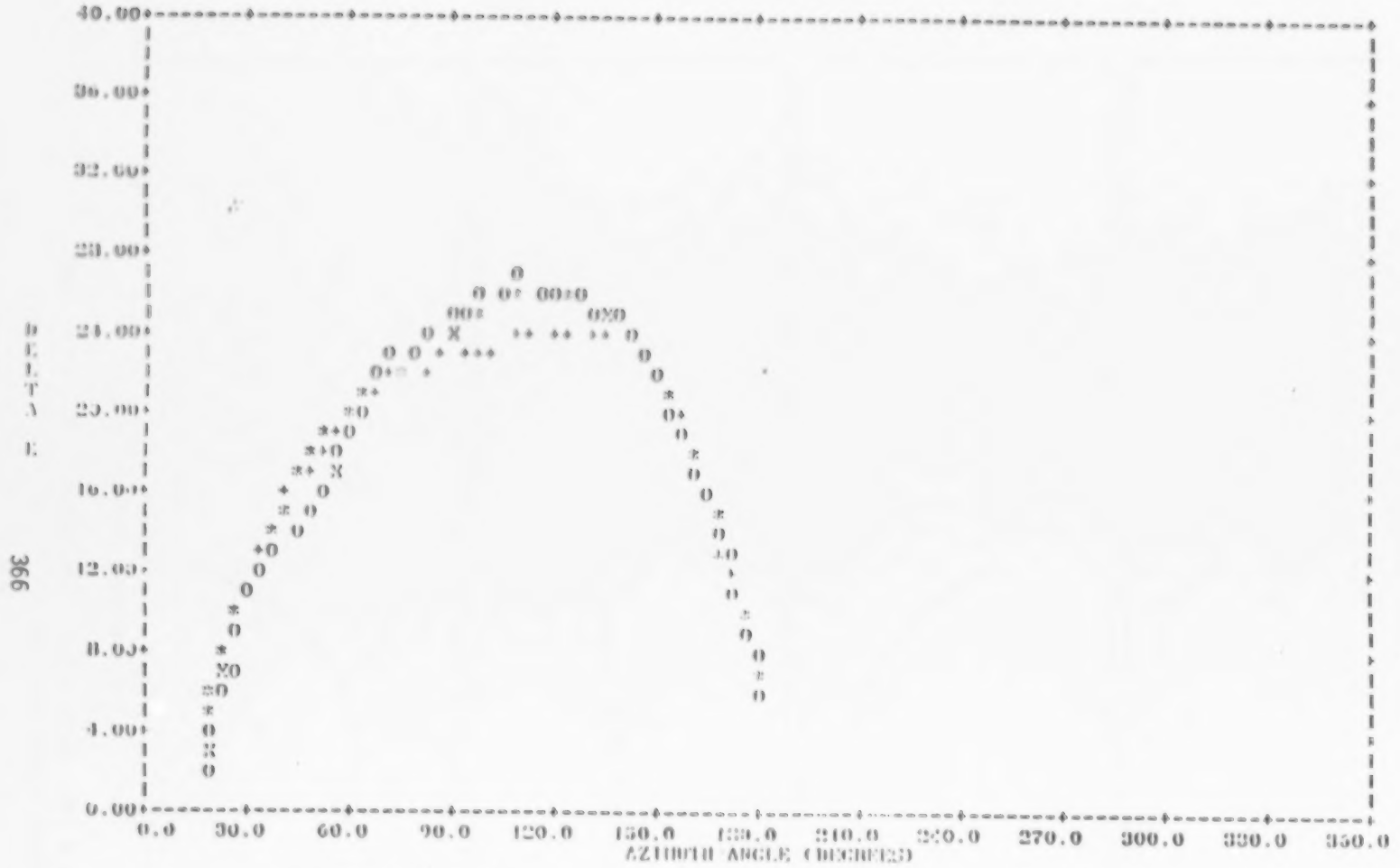


Exhibit C-2. This is a test plot--stable condition, 2 M/S wind speed, 11.3 degree wind direction

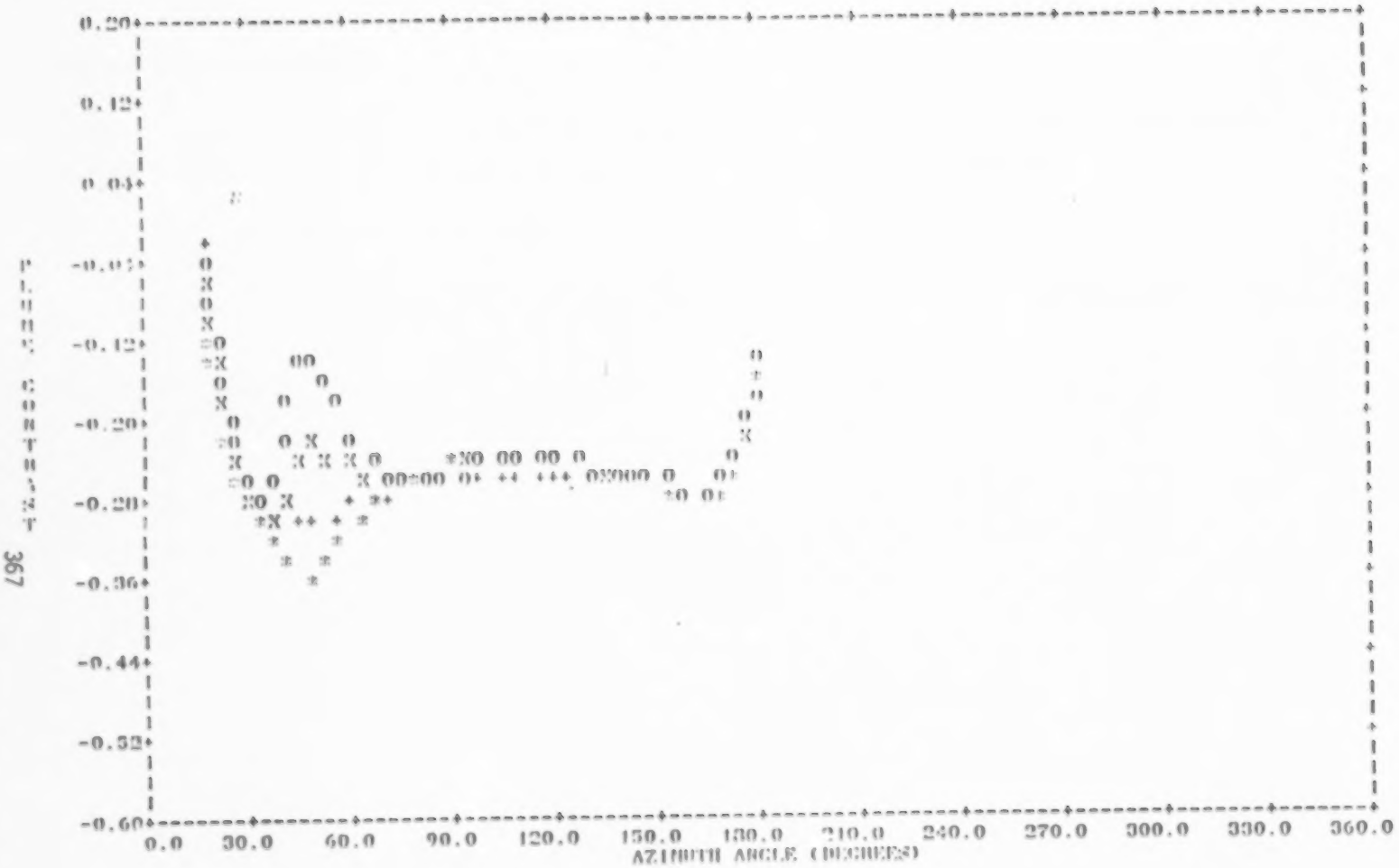


THIS IS A TEST PLOT

STABLE CONDITION, 2.2 M/S WIND SPEED 11.3 DEGREE WIND DIRECTION

ASSUMED VIEWING BACKGROUND - 1.=(+) CLEAR SKY 2.=(=) WHITE OBJECT 3.=(X) GRAY OBJECT 4.=(0) BLACK OBJECT

Exhibit C-3. Example of line-printer output

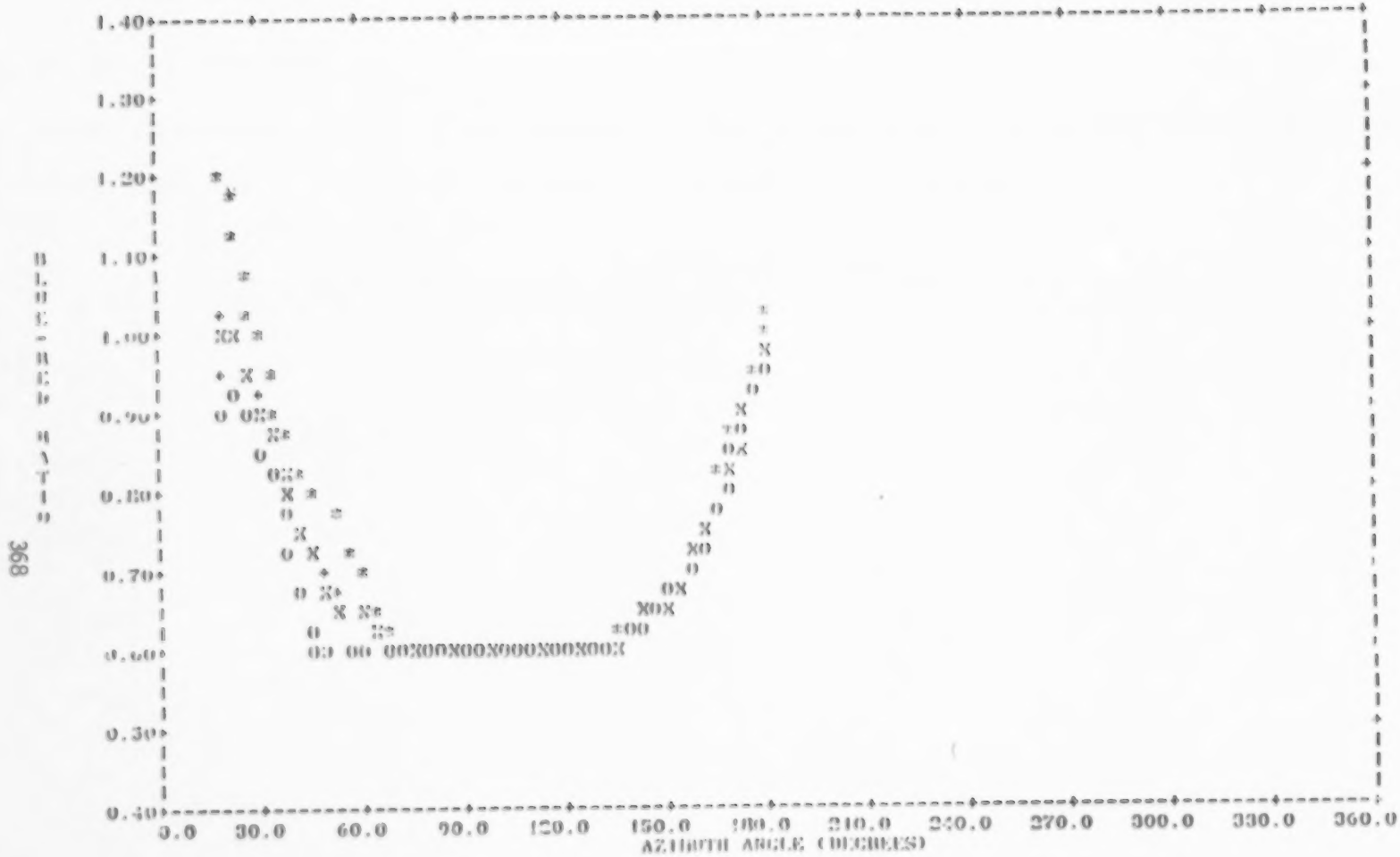


THIS IS A TEST PLOT

STABLE CONDITION. 2.2 M/S WIND SPEED 11.3 DEGREE WIND DIRECTION

ASSUMED VIEWING BACKGROUND - 1.=(+) CLEAR SKY 2.=(0) WHITE OBJECT 3.=(X) GRAY OBJECT 4.=(O) BLACK OBJECT

Exhibit C-3 (continued)

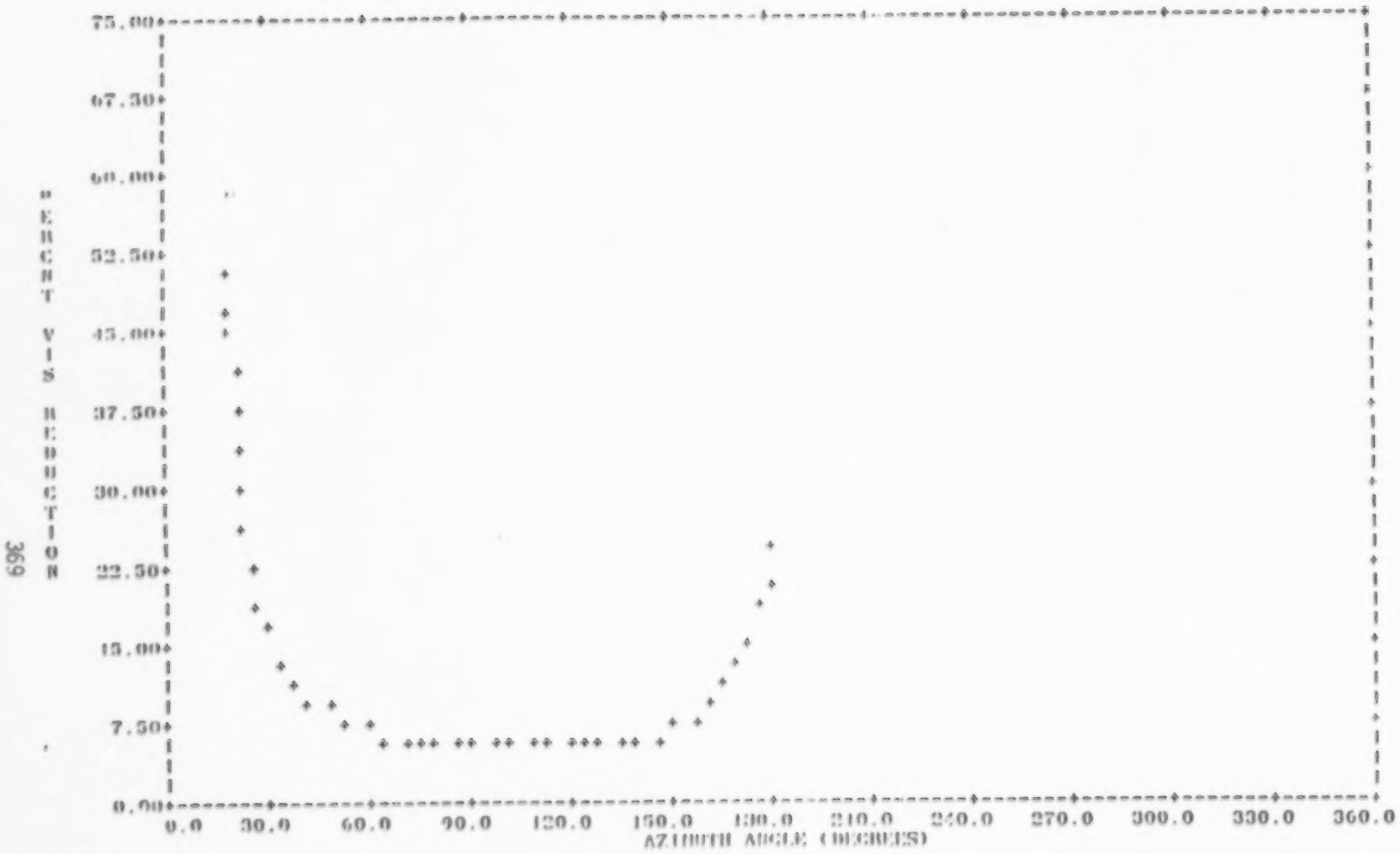


THIS IS A TEST PLOT

STABLE CONDITION. 2.2 M/S WIND SPEED 11.3 DEGREE WIND DIRECTION

OBSERVED VIEWING BACKGROUND - 1.=(+) CLEAR SKY 2.=(=) WHITE OBJECT 3.=(X) GRAY OBJECT 4.=(0) BLACK OBJECT

Exhibit C-3 (continued)



THIS IS A TEST PLOT

STABLE CONDITION, 2.2 M/S WIND SPEED 11.3 DEGREE WIND DIRECTION

ASSUMED VIEWING BACKGROUND - 1.=(+) CLEAR SKY 2.=(*) WHITE OBJECT 3.=(X) GRAY OBJECT 4.=(0) BLACK OBJECT

Exhibit C-3 (concluded)

Appendix D

VISPLOT SOURCE CODE

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```
(0001)  C      PROGRAM VISPLT (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7,
(0002)  C     1TAPE8,TAPE9)
(0003)  C
(0004)  C ------------------------------------------------------------------
(0005)  C
(0006)  C     VISPLT IS PART OF A SET OF SOFTWARE PACKAGE USED IN
(0007)  C  VISIBILITY STUDY PROGRAMS.  VISPLT IS A GRAPHICS PACKAGE
(0008)  C  INCORPORATING CALCOMP PLOTTING ROUTINES (IF DESIRED)TO PLOT THE
(0009)  C  RESULTS GENERATED FROM THE VISIBILITY MODEL, PLUVUE.
(0010)  C
(0011)  C ------------------------------------------------------------------
(0012)  C
(0013)  C --- FORTRAN FILE UNITS
(0014)  C
(0015)  C              TAPE 5 - INPUT FILE (CONTROL OPTIONS, TITLES, ETC)
(0016)  C              TAPE 6 - OUTPUT FILE (LINE PRINTER PLOTS, ETC)
(0017)  C              TAPE 7 - PLUVUE RESULTS
(0018)  C
(0019)  C ------------------------------------------------------------------
(0020)  C
(0021)  C  MAIN ROUTINE
(0022)  C
(0023)  C ------------------------------------------------------------------
(0024)  C
(0025)  C --- COMMON BLOCKS
(0026)  C
(0027)        COMMON /PLTS/ PLT1(18,8),PLT2(18,8),PLT3(18,8),
(0028)       1              PLT8(18,8),PLT1A(18,8,2),PLT2A(18,8,2),
(0029)       1              PLT3A(18,8,2),PLT4A(18,8,2)
(0030)        COMMON /CPLT/ FRST(4),FIN(4),SCAL1(4),TSTP(4),ASTP(4),
(0031)       1              NDEC(4),ITITLE(5,4),NT(4),XMAX
(0032)        COMMON /POOL/ XSIZ,YSIZ,CYCSIZ,X(18),INDX,IC1
(0033)        COMMON /ITIT1/ ITIT(80),KALCMP,IOBS
(0034)        COMMON /NEED1/ SCTANG(8),IC2,ISTB,WIND,WDIR
(0035)        COMMON /LBL2/ LBEL(3,8)
(0036)  C
(0037)  C --- VARIABLES IN COMMON BLOCKS ARE INITIALIZE IN THE UNLABELLED
(0038)  C     BLOCK DATA.  LOCAL VARIABLES ARE INITIALIZED HERE
(0039)  C
(0040)        DATA XOFF,YOFF/1.,1.5/
(0041)        DATA NX,NANG/16,4/
(0042)  C
(0043)  C
(0044)  C --- READ CONTROL CARD WITH OPTIONS
(0045)  C
(0046)        READ (5,100) OBSVUE,CALCMP,CASE,AXFLAG,CAS1,ALBL
(0047)        IOBS=IFIX(OBSVUE+0.1)
(0048)        KALCMP=IFIX(CALCMP+0.1)
(0049)        ICAS=IFIX(CASE+0.1)
(0050)        IAX=IFIX(AXFLAG+0.1)
(0051)        IF (AXFLAG.LT.0.) IAX=-1
(0052)        IC1=IFIX(CAS1+0.1)
(0053)        LBL1=IFIX(ALBL+0.1)
(0054)  C
(0055)  C --- READ IN AXIS SCALING (IF DESIRED)
(0056)  C
```

```
(0057)          IF (IOBS.GT.0) READ (5,100) XMM1
(0058)          IF (IOBS.GT.0.AND.XMM1.GT.0.01) XMAX=XMM1
(0059)          IF (IAX.GE.0) GO TO 1
(0060)          READ (5,100) FR1,FR2,FR3,FR4,FR5,FR6,FR7,FR8
(0061)          IF (FR1.GT.-998.) FRST(4)=FR1
(0062)          IF (FR2.GT.-998.) FIN(4)=FR2
(0063)          IF (FR3.GT.-998.) FRST(3)=FR3
(0064)          IF (FR4.GT.-998.) FIN(3)=FR4
(0065)          IF (FR5.GT.-998.) FRST(2)=FR5
(0066)          IF (FR6.GT.-998.) FIN(2)=FR6
(0067)          IF (FR7.GT.-998.) FRST(1)=FR7
(0068)          IF (FR8.GT.-998.) FIN(1)=FR8
(0069)        1 CONTINUE
(0070)          IF (IOBS.GT.0) CYCSIZ=ALOG10(XMAX)
(0071)    C
(0072)    C --- READ PLOT TITLE
(0073)    C
(0074)          READ (5,115) ITIT
(0075)    C
(0076)    C --- READ IN AZIMUTH ANGLES OR DOWNWIND DISTANCES
(0077)    C
(0078)          READ (5,105) (X(I),I=1,16)
(0079)    C
(0080)    C --- IF THE OBSERVER LINE OF SIGHT IS PERPENDICULAR TO THE
(0081)    C     PLUME  THEN USE LOGARITHMIC HORIZONTAL AXIS
(0082)    C
(0083)          IF (IOBS.GT.0) CALL LOGX(X,IAX)
(0084)    C
(0085)    C --- READ IN PARAMETER CASES AND LABELS
(0086)    C
(0087)          READ (5,105) (SCTANG(I),I=1,IC1)
(0088)          IF (LBL1.LE.0) GO TO 3
(0089)          DO 2 J=1,IC1
(0090)          READ (5,120) (LBEL(I,J),I=1,3)
(0091)        2 CONTINUE
(0092)        3 CONTINUE
(0093)    C
(0094)    C --- SET UP X SCALING FACTOR FOR CALCOMP USE
(0095)    C
(0096)          X(17) =0.
(0097)          X(18)=XSIZ/XMAX
(0098)          IF (IOBS.GT.0) X(18)=CYCSIZ
(0099)    C
(0100)    C --- READ PLUVUE RESULTS AND PLOT THEM
(0101)    C
(0102)    C --- FIRST INITIALIZE PLOT PACKAGE
(0103)    C
(0104)          IF (KALCMP.LE.0) GO TO 4
(0105)          CALL PLOTS(X1,Y1,14)
(0106)          CALL PLTAX(0.07,0.07,999.,2.)
(0107)        4 CONTINUE
(0108)    C
(0109)          DO 23 I=1,ICAS
(0110)          READ (5,125) ISTB,WIND,WDIR
(0111)          CALL RDPLT (IOBS,PLT1A,PLT2A,PLT3A,PLT4A,IC1)
(0112)    C
```

```
(0113)  C --- SET UP ORIGIN AND ABSCISSA
(0114)  C
(0115)        IF (KALCMP.GT.0)
(0116)       1CALL ORGPLT (IOBS,XSIZ,X(18),1,ISTB,WIND,WDIR,JALPHA,XMAX,IAX)
(0117)  C
(0118)        JALPHA=1
(0119)  C
(0120)  C --- DRAW EACH OF THE FOUR PLOTS
(0121)  C
(0122)  C --- PLOT 4  --  LIGHT INTENSITY ETC
(0123)  C
(0124)        INDX=1
(0125)  C
(0126)        CALL VVMNMX (PLT4A(1,1,JALPHA),18,NX,1,ZMIN,ZMAX)
(0127)        IF (IAX.GT.0) FRST(4)=ZMIN
(0128)        IF (IAX.GT.0) FIN(4)=ZMAX
(0129)        PLT4A(NX+1,1,JALPHA)=FRST(4)
(0130)        SCAL1(4)=YSIZ/(FIN(4)-FRST(4))
(0131)        CALL PLOTIT(FRST(4),FIN(4),SCAL1(4),TSTP(4),ASTP(4),
(0132)       1            NDEC(4),INDX,NT(4),PLT4A(1,1,JALPHA))
(0133)        CALL ISOPLT (A,B,3)
(0134)  C
(0135)  C --- MOVE PEN UP (IF CALCOMP PLOTTING  )
(0136)  C
(0137)        IF (KALCMP.LE.0) GO TO 5
(0138)        CALL PLOT (0.,YSIZ+0.1,-3)
(0139)  C
(0140)      5 INDX=2
(0141)  C
(0142)  C --- PLOT3  --  PLUME CONTRAST
(0143)  C
(0144)        CALL VVMNMX(PLT3A(1,1,JALPHA),18,NX,1,ZMIN,ZMAX)
(0145)        IF (IAX.GT.0) FRST(3)=ZMIN
(0146)        IF (IAX.GT.0) FIN(3)=ZMAX
(0147)        SCAL1(3)=YSIZ/(FIN(3)-FRST(3))
(0148)        PLT3A(NX+1,1,JALPHA)=FRST(3)
(0149)        CALL PLOTIT (FRST(3),FIN(3),SCAL1(3),TSTP(3),ASTP(3),
(0150)       1            NDEC(3),INDX,NT(3),PLT3A(1,1,JALPHA))
(0151)        CALL ISOPLT(A,B,3)
(0152)  C
(0153)  C --- MOVE PEN UP FOR NEXT PLOT
(0154)  C
(0155)        IF (KALCMP.LE.0) GO TO 10
(0156)        CALL PLOT (0.,YSIZ+0.1,-3)
(0157)  C
(0158)  C --- PLOT2  --  BLUE-RED RATIO
(0159)  C
(0160)     10 INDX=3
(0161)        CALL VVMNMX(PLT2A(1,1,JALPHA),18,NX,1,ZMIN,ZMAX)
(0162)        IF (IAX.GT.0) FRST(2)=ZMIN
(0163)        IF (IAX.GT.0) FIN(2)=ZMAX
(0164)        SCAL1(2)=YSIZ/(FIN(2)-FRST(2))
(0165)        PLT2A(NX+1,1,JALPHA)=FRST(2)
(0166)        CALL PLOTIT(FRST(2),FIN(2),SCAL1(2),TSTP(2),ASTP(2),
(0167)       1            NDEC(2),INDX,NT(2),PLT2A(1,1,JALPHA))
(0168)        CALL ISOPLT(A,B,3)
```

```
(0169)  C
(0170)  C --- MOVE PEN UP FOR NEXT PLOT
(0171)  C
(0172)        IF (KALCMP.LE.0) GO TO 15
(0173)        CALL PLOT (0.,YSIZ+0.1,-3)
(0174)  C
(0175)  C --- PLOT1  --  VISIBILITY REDUCTION
(0176)  C
(0177)     15 INDX=4
(0178)        CALL VVMNMX(PLT1A(1,1,JALPHA),18,NX,1,ZMIN,ZMAX)
(0179)        IF (IAX.GT.0) FRST(1)=ZMIN
(0180)        IF (IAX.GT.0) FIN(1)=ZMAX
(0181)        SCAL1(1)=YSIZ/(FIN(1)-FRST(1))
(0182)        PLT1A(NX+1,1,JALPHA)=FRST(1)
(0183)        CALL PLOTIT (FRST(1),FIN(1),SCAL1(1),TSTP(1),ASTP(1),
(0184)       1            NDEC(1),INDX,NT(1),PLT1A(1,1,JALPHA))
(0185)        CALL ISOPLT(A,B,3)
(0186)  C
(0187)  C --- PLOT HEADER
(0188)  C
(0189)        IF (KALCMP.LE.0) GO TO 25
(0190)        CALL HEADER (YSIZ,IOBS)
(0191)  C
(0192)  C --- SUBMIT CALCOMP PLOT
(0193)  C
(0194)        CALL PLOT (10.,2.,999)
(0195)  C
(0196)     25 CONTINUE
(0197)        STOP
(0198)  C
(0199)  C --- FORMAT STATEMENTS
(0200)  C
(0201)    100 FORMAT (8F10.0)
(0202)    105 FORMAT (16F5.0)
(0203)    110 FORMAT (8F10.0)
(0204)    115 FORMAT (80A1)
(0205)    120 FORMAT (3A4)
(0206)    125 FORMAT (A4,1X,2F5.0)
(0207)        END
```

```
(0208)          SUBROUTINE ORGPLT (IOBS,XSIZE,SCALEX,ICASE,ISTAB,WIND,WDIR,JALPHA,
(0209)         1  XMAX,IAX)
(0210)    C
(0211)    C --- SET UP ORIGIN AND ABSCISSA FOR CALCOMP PLOTS
(0212)    C
(0213)          CALL PLOT(1.0,1.5,-3)
(0214)          IF (IOBS.LE.0) CALL XAXSTT (XSIZE,SCALEX)
(0215)          IF (IOBS.LE.0) GO TO 5
(0216)          CALL LOGTCK (XSIZE,SCALEX)
(0217)          CALL LOGLBL(XMAX,SCALEX,XMAX,IAX)
(0218)    C
(0219)    C --- SET IN TITLE
(0220)    C
(0221)        5 CALL TITLE (PLANT,ICASE,ISTAB,WIND,WDIR,RNOX,JALPHA)
(0222)    C
(0223)          RETURN
(0224)          END
```

```
(0225)          BLOCK DATA
(0226)    C
(0227)    C --- INITIALIZE COMMON BLOCKS
(0228)    C
(0229)          COMMON /PLTS/ PLT1(18,8),PLT2(18,8),PLT3(18,8),
(0230)         1              PLT8(18,8),PLT1A(18,8,2),PLT2A(18,8,2),
(0231)         1              PLT3A(18,8,2),PLT4A(18,8,2)
(0232)          COMMON /CPLT/ FRST(4),FIN(4),SCAL1(4),TSTP(4),ASTP(4),
(0233)         1              NDEC(4),ITITLE(5,4),NT(4),XMAX
(0234)          COMMON /POOL/ XSIZ,YSIZ,CYCSIZ,X(18),INDX,IC1
(0235)          COMMON /SIZE/ JGRID(97,40),TVERT(52,2),PT(20,4)
(0236)          COMMON /NEED1/ SCTANG(8),IC2,ISTAB,WIND,WD1R
(0237)          COMMON /LBL2/ LBEL(3,8)
(0238)    C
(0239)          DATA XSIZ,YSIZ,CYCSIZ/6.5,2.0,2.5/,XMAX/360./
(0240)          DATA FRST/0.,0.6,-.16,0./
(0241)          DATA FIN /20.,1.0,0.0,20./
(0242)          DATA TSTP,ASTP/4*0.,5.,0.1,0.02,5./
(0243)          DATA PLT1A/288*0./
(0244)          DATA NDEC/2*1,2,1/,IC2/4/
(0245)          DATA SCTANG /1.,2.,3.,4.,5.,6.,7.,8./
(0246)          DATA LBEL/4HCLEA,4HR SK,4HY    ,4HWHIT,4HE OB,
(0247)         1           4HJECT,4HGRAY,4H OBJ,4HECT ,
(0248)         2           4HBLAC,4HK OB,4HJECT,
(0249)         3           12*4H      /
(0250)          DATA ITITLE/4HPERC,4HNT V,4HIS R,4HEDUC,4HTION,
(0251)         1             4HBLUE,4H-RED,4H RAT,4HIO  ,4H    ,
(0252)         2             4HPLUM,4HE CO,4HNTRA,4HST  ,4H    ,
(0253)         3             4HDELT,4HA E ,3*4H     /
(0254)          DATA NT/20,14,14,7/
(0255)          DATA TVERT/104*4H    /
(0256)          DATA PT/1HD,1HE,1HL,1HT,1HA,1H ,1HE,13*1H  ,
(0257)         1        1HP,1HL,1HU,1HM,1HE,1H ,1HC,1HO,1HN,1HT,1HR,1HA,1HS,1HT,
(0258)         1        6*1H ,
(0259)         1        1HB,1HL,1HU,1HE,1H-,1HR,1HE,1HD,1H ,1HR,1HA,1HT,1HI,1HO,
(0260)         1        6*1H ,
(0261)         1        1HP,1HE,1HR,1HC,1HN,1HT,1H ,1HV,1HI,1HS,1H ,1HR,1HE,1HD,
(0262)         1        1HU,1HC,1HT,1HI,1HO,1HN /
(0263)          END
```

```
(0264)            SUBROUTINE RDPLT(IOBS,PLT1A,PLT2A,PLT3A,PLT4A,NNA)
(0265)      C
(0266)      C --- READS PLUVUE RESULTS
(0267)      C
(0268)            DIMENSION PLT1(18,8),PLT2(18,8),PLT3(18,8),PLT4(18,8)
(0269)            DIMENSION PLT1A(18,8,2),PLT2A(18,8,2),PLT3A(18,8,2),
(0270)           1          PLT4A(18,8,2),DUMMY(18,8,4)
(0271)            NX=16
(0272)            NANG=4
(0273)            LM=1
(0274)            READ(7) ((DUMMY(I,J,1),I=1,NX),J=1,NANG)
(0275)            READ(7) ((DUMMY(I,J,2),I=1,NX),J=1,NANG)
(0276)            READ(7) ((DUMMY(I,J,3),I=1,NX),J=1,NANG)
(0277)            READ(7) ((DUMMY(I,J,4),I=1,NX),J=1,NANG)
(0278)            DO 3 K=1,NANG
(0279)            DO 2 L=1,NX
(0280)            PLT1(L,K)=DUMMY(L,K,1)
(0281)            PLT2(L,K)=DUMMY(L,K,2)
(0282)            PLT3(L,K)=DUMMY(L,K,3)
(0283)            PLT4(L,K)=DUMMY(L,K,4)
(0284)          2 CONTINUE
(0285)          3 CONTINUE
(0286)         60 CONTINUE
(0287)      C
(0288)      C     THE CLEAR SKY VALUES ARE PUT IN J=1 FOR 1M/S CASE,
(0289)      C     J=2 FOR 2M/S CASE, J=3 FOR 4M/S CASE.  THIS ALLOWS
(0290)      C     USE OF PLOTIT W/O ANY MAJOR CHANGES, BUT IT'S NOT
(0291)      C     ELEGANT.
(0292)      C
(0293)            DO 50 J=1,NANG
(0294)            II=NX+1
(0295)            DO 50 I=1,NX
(0296)              II=I
(0297)            IF (J.GT.1.AND.IOBS.LE.0) GO TO 10
(0298)            PLT1A(II,J,1)=PLT1(I,J)
(0299)            IF (PLT1A(II,J,1).LT.0.) PLT1A(II,J,1)=0.
(0300)         10 CONTINUE
(0301)            PLT2A(II,J,1)=PLT2(I,J)
(0302)            PLT3A(II,J,1)=PLT3(I,J)
(0303)            PLT4A(II,J,1)=PLT4(I,J)
(0304)         50 CONTINUE
(0305)            RETURN
(0306)            END
```

```
(0307)          SUBROUTINE HEADER(YSIZ,IOBS)
(0308)    C
(0309)    C   ***  PLACE MESSAGE AT TOP OF PLOTS
(0310)    C
(0311)          COMMON /LBL2/ LBEL(3,8)
(0312)          COMMON /POOL/ XSZ,YSZ,CYCZ,XN(18),IND,IC1
(0313)    C
(0314)          IF (IOBS.LE.0)
(0315)         1CALL SYMBOL(0.,YSIZ+.35,.07,28H ASSUMED VIEWING BACKGROUND:,0.,28)
(0316)          IF (IOBS.GT.0)
(0317)         1CALL SYMBOL(0.,YSIZ+.35,0.07,18H LEGEND:           ,0.,18)
(0318)          XX=999.
(0319)          YY=999.
(0320)          DO 2 I=1,IC1
(0321)          IF (I.EQ.1.OR.I.EQ.5) XX=0.
(0322)          IF (I.EQ.1) YY=YSIZ+0.2
(0323)          IF (I.EQ.5) YY=YSIZ+0.05
(0324)          CALL NUMBER (XX,YY,0.07,FLOAT(I),0.,-1)
(0325)          IF (I.EQ.1.OR.I.EQ.5) XX=999.
(0326)          IF (I.EQ.1.OR.I.EQ.5) YY=999.
(0327)          CALL SYMBOL (XX,YY,0.07,1H-,0.,1)
(0328)          DO 1 J=1,3
(0329)          CALL SYMBOL (XX,YY,0.07,LBEL(J,I),0.,4)
(0330)        1 CONTINUE
(0331)          CALL SYMBOL (XX,YY,0.07,2H, ,0.,2)
(0332)        2 CONTINUE
(0333)    C
(0334)          RETURN
(0335)          END
```

```
(0336)  C
(0337)        SUBROUTINE LOGTCK (XSIZ,CYCSIZ)
(0338)  C
(0339)  C     *** DRAWS THE X-AXIS LOGARITHMIC TICK MARKS
(0340)  C
(0341)        DO 20 I=1,3
(0342)            X0 = (I-1)*CYCSIZ
(0343)            DO 10 J=1,10
(0344)                X = ALOG10 (FLOAT(J)) * CYCSIZ
(0345)                IF (X0+X .GT. XSIZ) RETURN
(0346)                CALL PLOT (X+X0,0.,3)
(0347)                CALL PLOT (X+X0,0.07,2)
(0348)     10         CONTINUE
(0349)     20   CONTINUE
(0350)  C
(0351)        RETURN
(0352)        END
```

```
(0353)          SUBROUTINE LOGX (X,IAX)
(0354)    C
(0355)    C     *** SET UP THE X VALUES FOR VISIBILITY PLOTS
(0356)    C
(0357)          DIMENSION X(18)
(0358)    C
(0359)    C
(0360)          DO 10 I=1,16
(0361)              X(I) = ALOG10(X(I))
(0362)       10 CONTINUE
(0363)    C
(0364)          RETURN
(0365)          END
```

```
(0366)  C
(0367)  C
(0368)        SUBROUTINE PLOT1T (FRST,FIN,SCAL1,TSTP,ASTP,NDEC,ITITLE,NT,Y)
(0369)  C
(0370)  C     *** PLOTS THE SUBPLOTS
(0371)  C
(0372)        DIMENSION Y(18,1)
(0373)        COMMON /POOL/ XSIZ,YSIZ,CYCSIZ,X(18),INDX,IC1
(0374)        COMMON /ITIT1/ ITIT(80),KALCMP,IOBS
(0375)        COMMON /NEED/ FINXX,FINYY,FRSTX,FRSTY
(0376)        COMMON /VVLBL1/ FCTR,DIST,CHRSZ,NCHR,OZLBL
(0377)        COMMON /NEED1/ SCTANG(8),IC2,ISTAB,WIND,WDIR
(0378)        DATA FIRSTX,FINX,SCALEX,ASTPX,NDECX,TSTPX,ITITLX,NTX/0.,360.,
(0379)       1 .0181,0.,0,45.,1H ,-1/
(0380)        CHRSZ=0.07
(0381)        NCHR=3
(0382)        FCTR=.2
(0383)        DIST=100.
(0384)        FRSTX=0.
(0385)        FINXX=360.
(0386)        FRSTY=FRST
(0387)        FINYY=FIN
(0388)        XX=FLOAT(INDX)
(0389)        YY=1.
(0390)        CALL ISOPLT (XX,YY,1)
(0391)        X(18)=1./X(18)
(0392)  C
(0393)  C --- GO TO LINE PRINTER PLOTING IF CALCOMP IS NOT DESIRED
(0394)  C
(0395)        IF (KALCMP.LE.0) GO TO 5
(0396)  C
(0397)  C     *** DRAW A FRAME
(0398)  C
(0399)        CALL NEWPEN (2)
(0400)        CALL BOX (0.,0.,XSIZ,YSIZ)
(0401)  C
(0402)  C
(0403)  C     *** RESET PEN AND DRAW X-AXIS TICKS
(0404)        CALL NEWPEN (1)
(0405)        IF (IOBS.LE.0)
(0406)       1CALL VVXAXS(0.,0.,FIRSTX,FINX,SCALEX,TSTPX,ASTPX,NDECX,0.,ITITLX,
(0407)       1 NTX)
(0408)        IF (IOBS.GT.0) CALL LOGTCK(XSIZ,CYCSIZ)
(0409)  C
(0410)  C     *** DRAW THE ORDINATE AXIS AND SET Y SCALING
(0411)  C
(0412)        IF (ITITLE.EQ.1) CALL VVYAXS (0.,0.,FRST,FIN,SCAL1,TSTP,ASTP,NDEC,
(0413)       1                              90.,20HDELTA E                ,20)
(0414)        IF (ITITLE.EQ.2) CALL VVYAXS (0.,0.,FRST,FIN,SCAL1,TSTP,ASTP,NDEC,
(0415)       1                              90.,20HPLUME CONTRAST         ,20)
(0416)        IF (ITITLE.EQ.3) CALL VVYAXS (0.,0.,FRST,FIN,SCAL1,TSTP,ASTP,NDEC,
(0417)       1                              90.,20HBLUE-RED RATIO         ,20)
(0418)        IF (ITITLE.EQ.4) CALL VVYAXS (0.,0.,FRST,FIN,SCAL1,TSTP,ASTP,NDEC,
(0419)       1                              90.,20HPERCNT VIS REDUCTION ,20)
(0420)  C
(0421)  C     *** MASK THE FRAME
```

```
(0422)  C
(0423)  C     *** DRAW THE EIGHT CASES WITH SPLINED LABELED LINES
(0424)  C
(0425)        5 DO 20 ICASE=1,IC1
(0426)  C
(0427)              IC2 = ICASE
(0428)              Y(18,ICASE)=(FIN-FRST)/YSIZ
(0429)              Y(17,ICASE)=Y(17,1)
(0430)              FCTR=FLOAT(ICASE)*0.15
(0431)              OZLBL=SCTANG(ICASE)
(0432)              CALL CURVE (X,Y(1,ICASE),16,1,KALCMP,0,0.3.)
(0433)  C
(0434)       20 CONTINUE
(0435)          NCHR=3
(0436)          X(18)=1./X(18)
(0437)  C
(0438)          RETURN
(0439)          END
```

```
(0440)  C
(0441)  C
(0442)        SUBROUTINE TITLE(PLANT,ICASE,ISTAB,WIND,WDIR,RNOX,J)
(0443)  C
(0444)  C     ***  PLOTS THE TITLE
(0445)  C
(0446)        DIMENSION ALPHA(2),FIG(2),STAB(2,2)
(0447)        COMMON /ITIT1/ ITIT(80), KALCMP, IOBS
(0448)        DATA ALPHA/90.,7.5/
(0449)        DATA FIG/1HA,1HB/,JBLANK/1H /
(0450)        DATA STAB/4HNEUT,4HRAL ,4HSTAB,4HLE  /
(0451)  C
(0452)        X=-1.0
(0453)        Y=-0.6
(0454)        CALL SYMBOL(X,Y,0.1,8H FIGURE ,0.,8)
(0455)        CALL NUMBER(999.,999.,0.1,FLOAT(ICASE),0.,-1)
(0456)        DO 1 I=1,60
(0457)        X=FLOAT(I-1)*0.1
(0458)      1 CALL SYMBOL(X,999.,0.1,ITIT(I),0.,1)
(0459)        X1=999.
(0460)        Y1=999.
(0461)        DO 2 I=1,20
(0462)        IF (ITIT(I+60).NE.JBLANK  ) GO TO 3
(0463)      2 CONTINUE
(0464)        X1=0.
(0465)        Y1=Y-0.2
(0466)        GO TO 7
(0467)      3 DO 4 I=1,20
(0468)        X=FLOAT(I)*0.1+0.8
(0469)      4 CALL SYMBOL(X,Y-0.2,0.1,ITIT(I+60),0.,1)
(0470)      7 CONTINUE
(0471)        CALL SYMBOL(X1,Y1,0.1,16HSTABILITY CLASS ,0.,16)
(0472)        CALL SYMBOL(999.,999.,0.1,ISTAB,0.,4)
(0473)        CALL NUMBER(0.,Y-.4,0.1,WIND,0.,1)
(0474)        CALL SYMBOL(999.,999.,0.1,16H M/S WIND SPEED ,0.,16)
(0475)        X=-1.0
(0476)        Y=-0.6
(0477)        CALL NUMBER(X+1.,Y-.6,0.1,WDIR,0.,1)
(0478)        CALL SYMBOL(999.,999.,0.1,23H KM VISUAL RANGE        ,0.,23)
(0479)        RETURN
(0480)  C
(0481)  C
(0482)        END
```

```
(0483)  C
(0484)  C
(0485)        SUBROUTINE XAXSTT(XSIZ,SCALEX)
(0486)  C
(0487)  C  *** ANOTATES X-AXIS
(0488)  C
(0489)        DIMENSION V(9)
(0490)        DATA V/0.,45.,90.,135.,180.,225.,270.,315.,360./
(0491)        Y0=-0.1
(0492)        X0=-SCALEX*45.
(0493)        X1=-X0
(0494)        DO 10 J=1,9
(0495)        X0=X0 + X1
(0496)        CALL NUMBER (X0,Y0,0.07,V(J),0.,-1)
(0497)     10 CONTINUE
(0498)  C
(0499)  C  ***  ADD TITLE
(0500)        XX=2.46
(0501)        CALL SYMBOL (XX,-0.22,0.07,23HAZIMUTH ANGLE (DEGREES),0.,23)
(0502)  C
(0503)        RETURN
(0504)        END
```

```
(0505)          SUBROUTINE LOGLBL (XMAX,CYCSIZ,X,IAX)
(0506)    C
(0507)    C     *** ANNOTATES THE LOGARITHMIC X-AXIS
(0508)    C
(0509)          DIMENSION V(10)
(0510)          DATA V/1.,2.,4.,6.,10.,20.,40.,60.,100.,200./
(0511)    C
(0512)          Y0=-0.1
(0513)          DO 10 J=1,10
(0514)             X0=ALOG10(V(J))*CYCSIZ
(0515)             CALL NUMBER(X0,Y0,0.07,V(J),0.,-1)
(0516)    10    CONTINUE
(0517)    C
(0518)    C     *** ADD TITLE
(0519)    C
(0520)          CALL SYMBOL (2.45,-0.22,0.07,22HDOWNWIND DISTANCE (KM),0.,22)
(0521)    C
(0522)          RETURN
(0523)          END
```

```
(0524)  CDECK VVMNMX
(0525)        SUBROUTINE VVMNMX (Z,ND1,NX,NY,ZMIN,ZMAX)
(0526)  C
(0527)  C     *** RETURNS THE MINIMUM AND MAXIMUM VALUES OF AN ARRAY
(0528)  C           GWL/SAI  DEC 77
(0529)  C
(0530)        DIMENSION Z(ND1,1)
(0531)  C
(0532)        ZMIN = +1.E20
(0533)        ZMAX = -1.E20
(0534)  C
(0535)  C     *** GET MISSING VALUE
(0536)        XXFLG=-999.
(0537)  C
(0538)        DO 20 J=1,NY
(0539)            DO 10 I=1,NX
(0540)                ZIJ = Z(I,J)
(0541)  C
(0542)  C             *** SKIP IF MISSING DATA
(0543)                IF (ZIJ .EQ. XXFLG) GO TO 10
(0544)                IF (ZIJ .LT. ZMIN) ZMIN = ZIJ
(0545)                IF (ZIJ .GT. ZMAX) ZMAX = ZIJ
(0546)     10     CONTINUE
(0547)     20 CONTINUE
(0548)  C
(0549)        RETURN
(0550)        END
```

```
(0551)  CDECK BOX
(0552)        SUBROUTINE BOX (X,Y,XLEN,YLEN)
(0553)  C
(0554)  C     *** SIMPLY PLOTS A RECTANGLE
(0555)  C         GWL/SAI   DEC 76
(0556)  C
(0557)  C         X,Y       COORDINATES IN INCHES OF LOWER LEFT CORNER
(0558)  C         XLEN      WIDTH OF THE BOX IN INCHES
(0559)  C         YLEN      HEIGHT OF THE BOX IN INCHES
(0560)  C
(0561)        CALL PLOT (X,Y,3)
(0562)        CALL PLOT (X,Y+YLEN,2)
(0563)        CALL PLOT (X+XLEN,Y+YLEN,2)
(0564)        CALL PLOT (X+XLEN,Y,2)
(0565)        CALL PLOT (X,Y,2)
(0566)  C
(0567)        RETURN
(0568)        END
```

```
(0569)  CDECK VVXAXS
(0570)        SUBROUTINE VVXAXS (X,Y,FIRSTV,FINALV,SCALE,TSTEP,ASTEP,NDEC,ANGLE,
(0571)       *      IBCD,NCHAR)
(0572)  C
(0573)  C     *** DRAWS AN X (HORIZONTAL) AXIS
(0574)  C           GW LUNDBERG/SAI  FEB 78
(0575)  C
(0576)  C         X,Y = COORDINATES IN INCHES OF AXIS LINE STARTING
(0577)  C               POINT
(0578)  C         FIRSTV = STARTING VALUE FOR THE AXIS
(0579)  C         FINALV = ENDING VALUE FOR THE AXIS
(0580)  C         SCALE = INCHES/UNIT FOR FIRSTV,FINALV,TSTEP,ASTEP
(0581)  C         TSTEP = STEP SIZE FOR TICS
(0582)  C         ASTEP = STEP SIZE FOR LABELED TICS
(0583)  C         NDEC = FORMAT FOR LABELS -- SEE SUBROUTINE NUMBER
(0584)  C         ANGLE = 0  DIVISION LABELS PARALLEL AXIS
(0585)  C               ' 0  DIVISION LABELS ARE NORMAL TO AXIS
(0586)  C         IBCD = THE AXIS TITLE AS ARRAY OR HOLLERITH STRING
(0587)  C         NCHAR = NUMBER OF CHARACTERS IN TITLE
(0588)  C               < 0, TIC MARKS, ANNOTATION AND TITLE PLOTTED ON
(0589)  C                  CLOCKWISE SIDE OF AXIS LINE
(0590)  C               > 0, ON COUNTER CLOCKWISE SIDE
(0591)  C
(0592)  C         THIS ROUTINE WAS WRITTEN FOR A MATRIX PLOTTER -- IT DOES
(0593)  C         NOT OPTIMIZE PEN MOVEMENTS.  THE ROUTINE SHOULD BE MACHINE
(0594)  C         INDEPENDENT
(0595)  C
(0596)        DIMENSION IBCD(1)
(0597)  C
(0598)  C     *** FOLLOWING ARE ADJUSTABLE -- IF LABEL > 0, ALL TICS ARE
(0599)  C         LABELED, IF LABEL = 0, THE LAST TIC IS NOT LABELED,
(0600)  C         IF LABEL < 0, THE FIRST AND LAST ARE NOT LABELED
(0601)        COMMON /VVAXES/ LABEL,T.CSIZ,DIGSIZ,CHRSIZ
(0602)  C
(0603)  C     *** VERTICAL CHARACTER SPACING
(0604)        DATA VSPACE/0.05/
(0605)  C
(0606)  C     *** DRAW THE AXIS LINE
(0607)        X0 = X
(0608)        Y0 = Y
(0609)        CALL PLOT (X0,Y0,3)
(0610)        NDIGS=0
(0611)        AXL = (FINALV-FIRSTV)*SCALE
(0612)        X1 = X0 + AXL
(0613)        CALL PLOT (X1,Y0,2)
(0614)  C
(0615)  C     *** ADD UNLABELED TICKS
(0616)        POS = 1.
(0617)        IF (NCHAR .LT. 0) POS = -1.
(0618)        IF (TSTEP .EQ. 0.) GO TO 200
(0619)        NTIC = (FINALV-FIRSTV)/TSTEP + 1
(0620)        DO 110 J=1,NTIC
(0621)            X1 = X0 + (J-1)*TSTEP*SCALE
(0622)            Y1 = Y0
(0623)            CALL PLOT (X1,Y1,3)
(0624)            Y1 = Y0 - POS*TICSIZ
```

```
(0625)              CALL PLOT (X1,Y1,2)
(0626)      110 CONTINUE
(0627)    C
(0628)    C       *** ADD LABELED TICKS
(0629)      200 IF (ASTEP .EQ. 0) GO TO 300
(0630)          MAXDIG = 1
(0631)          NTIC = (FINALV-FIRSTV)/ASTEP + 1
(0632)          DO 220 J=1,NTIC
(0633)              X1 = X0 + (J-1)*ASTEP*SCALE
(0634)              Y1 = Y0
(0635)              CALL PLOT (X1,Y1,3)
(0636)              Y1 = Y0 - POS*1.4*TICSIZ
(0637)              CALL PLOT (X1,Y1,2)
(0638)    C
(0639)    C         *** ADD THE LABEL IF WANTED
(0640)              IF (NDEC .EQ. 999) GO TO 220
(0641)              IF (J .EQ. 1 .AND. LABEL .LT. 0) GO TO 220
(0642)              IF (J .EQ. NTIC .AND. LABEL .LE. 0) GO TO 220
(0643)              FPN = FIRSTV + (J-1)*ASTEP
(0644)    C
(0645)              IF (ANGLE .EQ. 0.) GO TO 210
(0646)    C
(0647)    C         *** NORMAL TO AXIS
(0648)    C             MAXDIG IS USED TO GET TITLE OFFSET
(0649)              IF (NDIGS .GT. MAXDIG) MAXDIG = NDIGS
(0650)              Y1 = Y0 + VSPACE
(0651)              IF (POS .LT. 0.) Y1 = Y0-DIGSIZ*NDIGS-VSPACE+0.3*DIGSIZ
(0652)              X1 = X1 + 0.5*DIGSIZ
(0653)              CALL NUMBER (X1,Y1,DIGSIZ,FPN ,90.,NDEC)
(0654)              GO TO 220
(0655)    C
(0656)    C         *** PARALLEL TO AXIS
(0657)      210     X1 = X1 - 0.5 * (NDIGS*DIGSIZ - 0.3*DIGSIZ)
(0658)              Y1 = Y0 + VSPACE
(0659)              IF (POS .LT. 0.) Y1 = Y0 - DIGSIZ - VSPACE
(0660)              CALL NUMBER (X1,Y1,DIGSIZ,FPN ,0.,NDEC)
(0661)      220 CONTINUE
(0662)    C
(0663)    C       *** ADD TITLE
(0664)      300 IF (NCHAR .EQ. 0) GO TO 400
(0665)          HSPACE = 0.3*DIGSIZ
(0666)          IF (ANGLE .EQ. 0) HSPACE = 0.
(0667)          OFFSET = MAXDIG*DIGSIZ + 2.6*VSPACE - HSPACE
(0668)          Y1 = Y0 + OFFSET
(0669)          IF (POS .LT. 0.) Y1 = Y0 - OFFSET - CHRSIZ
(0670)          TSIZ = CHRSIZ*IABS(NCHAR)
(0671)          X1 = X0 + 0.5*(AXL-TSIZ)
(0672)          CALL SYMBOL (X1,Y1,CHRSIZ,IBCD,0.,IABS(NCHAR))
(0673)    C
(0674)    C       *** ALL DONE
(0675)      400 RETURN
(0676)          END
```

```
(0677)  CDECK VVYAXS
(0678)        SUBROUTINE VVYAXS (X,Y,FIRSTV,FINALV,SCALE,TSTEP,ASTEP,NDEC,ANGLE,
(0679)       $      IBCD,NCHAR)
(0680)  C
(0681)  C     *** DRAWS A Y (VERTICAL) AXIS
(0682)  C           GW LUNDBERG/SAI  FEB 78
(0683)  C
(0684)  C         X,Y = COORDINATES IN INCHES OF AXIS LINE STARTING
(0685)  C               POINT
(0686)  C         FIRSTV = STARTING VALUE FOR THE AXIS
(0687)  C         FINALV = ENDING VALUE FOR THE AXIS
(0688)  C         SCALE = INCHES/UNIT FOR FIRSTV,FINALV,TSTEP,ASTEP
(0689)  C         TSTEP = STEP SIZE FOR TICS
(0690)  C         ASTEP = STEP SIZE FOR LABELED TICS
(0691)  C         NDEC = FORMAT FOR LABELS -- SEE SUBROUTINE NUMBER
(0692)  C         ANGLE = 0  DIVISION LABELS PARALLEL AXIS
(0693)  C               ' 0  DIVISION LABELS ARE NORMAL TO AXIS
(0694)  C         IBCD = THE AXIS TITLE AS ARRAY OR HOLLERITH STRING
(0695)  C         NCHAR = NUMBER OF CHARACTERS IN TITLE
(0696)  C               < 0, TIC MARKS, ANNOTATION AND TITLE PLOTTED ON
(0697)  C                  CLOCKWISE SIDE OF AXIS LINE
(0698)  C               > 0, ON COUNTER CLOCKWISE SIDE
(0699)  C
(0700)        DIMENSION IBCD(1)
(0701)  C
(0702)  C     *** FOLLOWING ARE ADJUSTABLE -- IF LABEL > 0, ALL TICS ARE
(0703)  C         LABELED, IF LABEL = 0, THE LAST TIC IS NOT LABELED,
(0704)  C         IF LABEL < 0, THE FIRST AND LAST ARE NOT LABELED
(0705)        COMMON /VVAXES/ LABEL,TICSIZ,DIGSIZ,CHRSIZ
(0706)  C
(0707)  C     *** CHARACTER VERTICAL SPACING
(0708)        DATA VSPACE/0.05/
(0709)  C
(0710)  C     *** DRAW THE AXIS LINE
(0711)        X0 = X
(0712)        Y0 = Y
(0713)        NDIGS = 0
(0714)        CALL PLOT (X0,Y0,3)
(0715)        AXL = (FINALV-FIRSTV)*SCALE
(0716)        Y1 = Y0 + AXL
(0717)        CALL PLOT (X0,Y1,2)
(0718)  C
(0719)  C     *** ADD UNLABELED TICKS
(0720)        POS = 1.
(0721)        IF (NCHAR .LT. 0) POS = -1.
(0722)        IF (TSTEP .EQ. 0.) GO TO 200
(0723)        NTIC = (FINALV-FIRSTV)/TSTEP + 1
(0724)        DO 110 J=1,NTIC
(0725)           X1 = X0
(0726)           Y1 = Y0 + (J-1)*TSTEP*SCALE
(0727)           CALL PLOT (X1,Y1,3)
(0728)           X1 = X0 + POS*TICSIZ
(0729)           CALL PLOT (X1,Y1,2)
(0730)    110 CONTINUE
(0731)  C
(0732)  C     *** ADD LABELED TICKS
```

```
(0733)     200 IF (ASTEP .EQ. 0) GO TO 300
(0734)         MAXDIG = 1
(0735)         NTIC = (FINALV-FIRSTV)/ASTEP + 1
(0736)         DO 220 J=1,NTIC
(0737)              X1 = X0
(0738)              Y1 = Y0 + (J-1)*ASTEP*SCALE
(0739)              CALL PLOT (X1,Y1,3)
(0740)              X1 = X0 + POS*1.4*TICSIZ
(0741)              CALL PLOT (X1,Y1,2)
(0742)   C
(0743)   C          *** ADD THE LABEL IF WANTED
(0744)              IF (NDEC .EQ. 999) GO TO 220
(0745)              IF (J .EQ. 1 .AND. LABEL .LT. 0) GO TO 220
(0746)              IF (J .EQ. NTIC .AND. LABEL .LE. 0) GO TO 220
(0747)              FPN = FIRSTV + (J-1)*ASTEP
(0748)              NDIGS = NDEC + 2
(0749)              IF (ABS(FPN).GT.1.0E-5)
(0750)         1    NDIGS=IFIX(ALOG10(ABS(FPN))+.001)+NDEC+2
(0751)              IF (FPN.LT.0.) NDIGS = NDIGS + 1
(0752)              IF (FPN.LT.-.000001.AND.ABS(FPN).LT.0.1) NDIGS=NDIGS+1
(0753)   C
(0754)              IF (ANGLE .EQ. 0.) GO TO 210
(0755)   C
(0756)   C          *** NORMAL TO AXIS
(0757)   C               MAXDIG IS USED TO GET TITLE OFFSET -- SEE 300+1
(0758)              IF (NDIGS .GT. MAXDIG) MAXDIG = NDIGS
(0759)              X1 = X0 + VSPACE
(0760)              IF (POS .GT. 0.) X1 = X0-DIGSIZ*NDIGS-VSPACE+0.3*DIGSIZ
(0761)              IF (FPN .GT. 0..AND.FIRSTV.LT.0.) X1 = X1-DIGSIZ
(0762)              Y1 = Y1 - 0.5*DIGSIZ
(0763)              CALL NUMBER (X1,Y1,DIGSIZ,FPN ,0.,NDEC)
(0764)              GO TO 220
(0765)   C
(0766)   C          *** PARALLEL TO AXIS
(0767)     210      X1 = X0 - VSPACE
(0768)              IF (POS .LT. 0.) X1 = X0 + DIGSIZ + VSPACE
(0769)              Y1 = Y1 - 0.5 * (NDIGS*DIGSIZ - 0.3*DIGSIZ)
(0770)              CALL NUMBER (X1,Y1,DIGSIZ,FPN ,90.,NDEC)
(0771)     220 CONTINUE
(0772)   C
(0773)   C      *** ADD TITLE
(0774)     300 IF (NCHAR .EQ. 0) GO TO 400
(0775)         HSPACE = 0.3*DIGSIZ
(0776)         IF (ANGLE .EQ. 0.) HSPACE = 0.
(0777)         OFFSET = MAXDIG*DIGSIZ + 2.6*VSPACE - HSPACE
(0778)         X1 = X0 - OFFSET
(0779)         IF (POS .LT. 0.) X1 = X0 + OFFSET + CHRSIZ
(0780)         TSIZ = CHRSIZ*IABS(NCHAR)
(0781)         Y1 = Y0 + 0.5*(AXL-TSIZ)
(0782)         CALL SYMBOL (X1,Y1,CHRSIZ,IBCD,90.,IABS(NCHAR))
(0783)   C
(0784)   C      *** ALL DONE
(0785)     400 RETURN
(0786)         END
```

```
(0787)  CDECK PLTAX
(0788)        SUBROUTINE PLTAX (CHRSZ,DIGSZ,TICSZ,ENDS)
(0789)  C
(0790)  C     *** CHANGES DEFAULT AXES, FRAME, VVXAXS, VVYAXS ATTRIBUTES
(0791)  C           GWL/SAI  APRIL 78
(0792)  C
(0793)  C         CHRSZ      AXIS TITLE CHARACTER HEIGHT IN INCHES
(0794)  C         DIGSZ      HEIGHT OF NUMERIC LABELS IN INCHES
(0795)  C         TICSZ      TIC SIZE
(0796)  C         ENDS = 0.  FIRST AND LAST DIVISIONS ARE UNLABELED
(0797)  C              = 1.  LAST DIVISION IS UNLABELED
(0798)  C              = 2.  FIRST AND LAST DIVISIONS ARE LABELED
(0799)  C
(0800)        COMMON /VVAXES/ LABEL,TICS1Z,DIGS1Z,CHRS1Z
(0801)  C
(0802)        IF (CHRSZ .NE. 999. .AND. CHRSZ .NE. 0.) CHRS1Z = CHRSZ
(0803)        IF (DIGSZ .NE. 999. .AND. DIGSZ .NE. 0.) DIGS1Z = DIGSZ
(0804)        IF (TICSZ .NE. 999. .AND. TICSZ .NE. 0.) TICS1Z = TICSZ
(0805)        IF (ENDS .EQ. 999.) RETURN
(0806)        LABEL = -1
(0807)        IF (ENDS .EQ. 1.) LABEL = 0
(0808)        IF (ENDS .EQ. 2.) LABEL = 1
(0809)  C
(0810)        RETURN
(0811)        END
```

```
(0812)          SUBROUTINE CURVE (XARRAY,YARRAY,NPTS,INC,KALCMP,LINTYP,INTEQ,SIGMA
(0813)         1)
(0814)    C
(0815)    C     *** PURPOSE -- PLOTS A SMOOTH CURVE THROUGH THE DATA VALUES FROM T
(0816)    C         GW LUNDBERG,SAI   JULY  77
(0817)    C
(0818)    C          MODIFIED BY H HOGO AUG 1977
(0819)    C
(0820)    C         XARRAY  ARRAY CONTAINING X VALUES
(0821)    C         YARRAY  ARRAY CONTIANING Y VALUES
(0822)    C         NPTS    NUMBER OF DATA POINTS IN THE ARRAYS ACTUALLY USED
(0823)    C                ) 0  SCALING AT TOP OF ARRAYS
(0824)    C         INC     EVERY INC POINT WILL BE USED
(0825)    C         LINTYP  PLOT SPECIAL SYMBOL EVERY LINTYP POINT
(0826)    C                ) 0  CONNECTED SYMBOL PLOT
(0827)    C                = 0  LINE PLOT
(0828)    C                ( 0  UNCONNECTED SYMBOL PLOT
(0829)    C         INTEQ   INTEGER EQUIVALENT OF SPECIAL SYMBOL
(0830)    C         THIS ROUTINE CALLS  SYMBOL, PLOT, KURV1 AND KURV2
(0831)    C
(0832)          COMMON /VVLBL1/ FCTR,DIST,CHRST NCHR,OZLBL
(0833)          COMMON /HOUR/ OZR,NGG,TM
(0834)          COMMON /NEED/ HC,XN,HCF,XNF
(0835)          DIMENSION XARRAY(1), YARRAY(1), XI(50), YI(50), XP(50), YP(50), TE
(0836)         1MP(50)
(0837)    C
(0838)          DATA NSLOPE/0/,SLOPE1,SLOPEN/0.,0./
(0839)    C
(0840)    C
(0841)    C     *** LOCATE SCALING (FIRSTV AND DELTAV) FOR EACH ARRAY
(0842)    C         ------ ------- ------- --- ------- --- ---- -----
(0843)    C
(0844)    C
(0845)    C     *** SCALING IN TOP OF ARRAYS -- CALCOMP STANDARD
(0846)          N=NPTS*INC+1
(0847)          FIRSTX=XARRAY(N)
(0848)          FIRSTY=YARRAY(N)
(0849)          N=N+INC
(0850)          DELTAX=XARRAY(N)
(0851)          DELTAY=YARRAY(N)
(0852)          IX1=0
(0853)    C
(0854)          NUM=IABS(NPTS)
(0855)          IF (KALCMP.LE.0) GO TO 10
(0856)    C
(0857)    C     *** CHECK IF SYMBOL PLOT WANTED -- LINTYP () 0
(0858)          IF (LINTYP.EQ.0) GO TO 10
(0859)    C
(0860)    C     *** CENTERED SYMBOL PLOT
(0861)    C         -------- ------ ----
(0862)    C
(0863)    C     *** SCALE FIRST DATA POINT AND PLOT CENTERED SYMBOL
(0864)          X=(XARRAY(1)-FIRSTX)/DELTAX
(0865)          Y=(YARRAY(1)-FIRSTY)/DELTAY
(0866)          CALL SYMBOL (X,Y,0.1,INTEQ,0.,-1)
(0867)    C
```

```
(0868)  C     *** PLOT REMAINING SYMBOLS AT INCREMENTS OF MARK
(0869)        MARK=IABS(LINTYP)
(0870)        N=1
(0871)  C
(0872)        DO 5 J=2,NUM
(0873)        N=N+INC
(0874)        IF (MOD(N,MARK).NE.0) GO TO 5
(0875)        X=(XARRAY(N)-FIRSTX)/DELTAX
(0876)        Y=(YARRAY(N)-FIRSTY)/DELTAY
(0877)        CALL SYMBOL (X,Y,0.1,INTEQ,0.,-1)
(0878)      5 CONTINUE
(0879)  C
(0880)  C     *** IF THE SYMBOLS ARE NOT TO BE CONNECTED, RETURN
(0881)        IF (LINTYP.LT.0) GO TO 30
(0882)  C
(0883)  C     *** LINE PLOT (OR CONNECT SYMBOLS)
(0884)  C         ---- ---- -- ------ --------
(0885)  C
(0886)  C     *** SCALE FIRST DATA POINT AND MOVE PEN THERE
(0887)     10 XI(1)=(XARRAY(1)-FIRSTX)/DELTAX
(0888)        YI(1)=(YARRAY(1)-FIRSTY)/DELTAY
(0889)  C
(0890)  C
(0891)  C     *** SCALE THE REMAINING POINTS
(0892)        N=1
(0893)        DO 15 J=2,NUM
(0894)        N=N+INC
(0895)        XI(J)=(XARRAY(N)-FIRSTX)/DELTAX
(0896)        YI(J)=(YARRAY(N)-FIRSTY)/DELTAY
(0897)     15 CONTINUE
(0898)  C
(0899)        NSLP=NSLOPE
(0900)  C
(0901)  C     *** CHECK IF PERIODIC
(0902)        IF (ABS(XI(NUM)-XI(1)).LT.0.01.AND.ABS(YI(NUM)-YI(1)).LT.0.01)
(0903)       1  NSLP=-1
(0904)  C
(0905)  C     *** SET UP SPLINE INTERPOLATION
(0906)        NSLP=1
(0907)        SLOPE1=57.29578*ATAN((YI(1)-YI(2))/(XI(1)-XI(2)))
(0908)        IF (SLOPE1.GT.0.) SLOPE1=SLOPE1-180.
(0909)        SLOPE1=AMIN1(SLOPE1,-90.)
(0910)        SLOPEN=28.64789*ATAN((YI(N)-YI(N-1))/(XI(N)-XI(N-1)))
(0911)        CALL KURV1 (NUM,XI,YI,NSLP,SLOPE1,SLOPEN,XP,YP,TEMP,S,SIGMA)
(0912)        CALL KURV2 (0.,X,Y,NUM,XI,YI,XP,YP,S,SIGMA)
(0913)        X=AMAX1(HCF,X)
(0914)        Y=AMAX1(XNF,Y)
(0915)        USX=X*DELTAX+FIRSTX
(0916)        USY=Y*DELTAY+FIRSTY
(0917)        TM=1.
(0918)        CALL ISOPLT (USX,USY,2)
(0919)        TM=2.
(0920)  C
(0921)  C     *** LINE SEGMENTS WILL BE A TENTH INCH LONG -- S IS THE ARCLENGTH
(0922)        NP=10.*S+1
(0923)        CONST=1./NP
```

```
(0924)          DIST=S
(0925)          IF (KALCMP.LE.0) GO TO 20
(0926)          IF (USX.GT.HC.OR.USY.GT.XN) IX1=1
(0927)          CALL VVLBLF (XI(1),YI(1),1)
(0928)    C
(0929)    C     *** MAP AND PLOT SEGMENTS
(0930)       20 DO 25 J=1,NP
(0931)          T=-J*CONST
(0932)          CALL KURV2 (T,X,Y,NUM,XI,YI,XP,YP,S,SIGMA)
(0933)          X=AMAX1(HCF,X)
(0934)          Y=AMAX1(XNF,Y)
(0935)          USX=X*DELTAX+FIRSTX
(0936)          USY=Y*DELTAY+FIRSTY
(0937)          CALL ISOPLT (USX,USY,2)
(0938)          IF (KALCMP.LE.0) GO TO 25
(0939)          IF (USX.LE.HC.AND.USY.LE.XN) GO TO 24
(0940)          IF (IX1.GT.0) CALL VVLBLF (X,Y,1)
(0941)          GO TO 25
(0942)       24 IX1=0
(0943)          CALL VVLBLF (X,Y,2)
(0944)       25 CONTINUE
(0945)          IF (KALCMP.LE.0) GO TO 30
(0946)          CALL VVLBLF (0.,0.,3)
(0947)    C
(0948)       30 RETURN
(0949)    C
(0950)          END
```

```
(0951)          SUBROUTINE VVLBLF (X2,Y2,IENTRY)
(0952)    C
(0953)    C     *** SETS A LINE LABEL INTO A VECTOR PLOT PROVIDING THAT
(0954)    C         A CALL TO SUBROUTINE PLTLBL HAS PRESET THE NECESSARY
(0955)    C         PARAMETERS IN /VVLBL1/
(0956)    C             GW LUNDBERG/SAI  DEC !77
(0957)    C
(0958)    C     X2,Y2     THE TERMINAL POINT OF THE CURRENT VECTOR
(0959)    C               IN INCHES FROM PRESENT PLOT ORIGIN
(0960)    C
(0961)    C     *** NOTES --
(0962)    C         (1) THERE ARE THREE ENTRY POINTS -- VVLBLF SETS UP THE
(0963)    C             PARAMETERS FOR VVLBL1C WHICH ACTUALLY DOES THE LABELING.
(0964)    C             VVLBL1L CLEANS UP IN CASE THERE WAS NOT ENOUGH
(0965)    C             ROOM FOR THE LAST LABEL
(0966)    C         (2) THE LABELS ARE SEPERATED BY DIST INCHES EXCEPT FOR
(0967)    C             THE FIRST LABEL WHICH STARTS FACT*DIST INCHES FROM
(0968)    C             THE BEGINNING OF THE VECTOR PLOT -- THIS PROVIDES FOR
(0969)    C             STAGGERED LABELS.
(0970)    C
(0971)          DIMENSION XSV(20), YSV(20)
(0972)    C
(0973)    C     *** DIST IS THE DISTANCE IN INCHES BETWEEN LABELS.  FACT
(0974)    C         IS THE FACTOR (0-1) OF DIST TO USE FOR THE FIRST LABEL.
(0975)    C         CHRSZ IS THE SIZE OF THE LABEL CHARACTERS IN INCHES.
(0976)    C         NCHR IS THE NUMBER OF CHARACTERS (0-10), AND LABEL
(0977)    C         IS THE A-FORMATED TEXT OF THE LABEL
(0978)          COMMON /VVLBL1/ FACT,DIST,CHRSZ,NCHR,OZL
(0979)          DATA MXSV/20/
(0980)    C
(0981)    C     EMULATE MULTIPLE ENTRY WITH COMPUTED GO TO
(0982)          GO TO (1000,2000,3000),IENTRY
(0983)    C
(0984)    C     MAIN ENTRY POINT
(0985)     1000 CONTINUE
(0986)    C
(0987)    C     *** MOVE THE PEN TO THE FIRST POINT
(0988)          CALL PLOT (X2,Y2,3)
(0989)    C
(0990)    C     *** IF THERE ARE TO BE NO  ABELS -- JUST RETURN
(0991)          IF (NCHR.EQ.0) RETURN
(0992)    C
(0993)    C     *** SET UP THE OFFSET NECESSARY TO CENTER THE LABEL AND
(0994)    C         THE DISTANCE REQUIRED BY THE LABEL
(0995)          OFF=CHRSZ/2.
(0996)          SZLBL=NCHR*CHRSZ+2.*OFF-0.3*CHRSZ
(0997)    C
(0998)    C     *** INITALIZE THE ACCUMULATED LENGTH OF THE VECTORS, THE
(0999)    C         LENGTH REQUIRED BEFORE FIRST LABEL, AND THE NUMBER
(1000)    C         OF SAVED POINTS (VECTORS) THAT MAY HAVE BEEN PREEMPTED
(1001)    C         BY THE LABEL
(1002)          TOTSZ=0.
(1003)          SKPSZ=FACT*DIST
(1004)          NSV=0
(1005)    C
(1006)    C     *** REMEMBER THE STARTING LOCATION OF FIRST VECTOR
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(1007)          X1=X2
(1008)          Y1=Y2
(1009)   C
(1010)          RETURN
(1011)   C
(1012)   C*********************************************************************
(1013)   C                       ENTRY VVLBL1C
(1014)   C*********************************************************************
(1015)   C
(1016)    2000 CONTINUE
(1017)   C
(1018)   C       *** IF THERE ARE TO BE NO LABELS -- PLOT THE VECTOR AND RETURN
(1019)          IF (NCHR.GT.0) GO TO 5
(1020)          CALL PLOT (X2,Y2,2)
(1021)          RETURN
(1022)   C
(1023)   C       *** IF SEEKING ROOM FOR THE LABEL -- SKIP FOLLOWING
(1024)        5 IF (NSV.GT.0) GO TO 15
(1025)   C
(1026)   C       *** CALCULATE THIS VECTOR LENGTH AND ADD TO THE ACCUMULATED
(1027)   C           LENGTH.  IF A LABEL IS TO START IN THIS VECTOR, SKIP TO
(1028)   C           120, ELSE PLOT THE VECTOR AND RETURN
(1029)          VECSZ=SQRT((X2-X1)**2+(Y2-Y1)**2)
(1030)          TOTSZ=TOTSZ+VECSZ
(1031)          IF (TOTSZ.GT.SKPSZ) GO TO 10
(1032)          CALL PLOT (X2,Y2,2)
(1033)          X1=X2
(1034)          Y1=Y2
(1035)          RETURN
(1036)   C
(1037)   C       *** ITS TIME FOR A LABEL -- LOCATE START
(1038)       10 RATIO=(VECSZ-TOTSZ+SKPSZ)/VECSZ
(1039)          X1L=X1+RATIO*(X2-X1)
(1040)          Y1L=Y1+RATIO*(Y2-Y1)
(1041)   C
(1042)   C       *** PLOT SUBVECTOR AND REMEMBER THE END POINT
(1043)          CALL PLOT (X1L,Y1L,2)
(1044)          X1=X1L
(1045)          Y1=Y1L
(1046)   C
(1047)   C       *** FIND OUT IF THERE IS ENOUGH ROOM LEFT IN THIS VECTOR
(1048)   C           FOR THE LABEL -- IF THERE ISNT, SAVE (X2,Y2) AND RETURN
(1049)       15 HAVSZ=SQRT((X2-X1L)**2+(Y2-Y1L)**2)
(1050)          IF (HAVSZ.GE.SZLBL) GO TO 20
(1051)          NSV=NSV+1
(1052)   C
(1053)   C       *** CHECK FOR OVERFLOW
(1054)          IF (NSV.GT.MXSV) STOP
(1055)          XSV(NSV)=X2
(1056)          YSV(NSV)=Y2
(1057)          X1=X2
(1058)          Y1=Y2
(1059)          RETURN
(1060)   C
(1061)   C       *** CALCULATE THE END OF THE LABEL
(1062)   C           IM SURE THERE IS AN EASIER WAY TO DO THIS, BUT IT
```

```
(1063)  C          ESCAPES ME
(1064)       20 A=(X2-X1)**2+(Y2-Y1)**2
(1065)          B=-2*((X1L-X1)*(X2-X1)+(Y1L-Y1)*(Y2-Y1))
(1066)          C=(X1L-X1)**2+(Y1L-Y1)**2-SZLBL*SZLBL
(1067)  C
(1068)          SQRTD=SQRT(B*B-4*A*C)
(1069)          T1=(-B+SQRTD)/(2*A)
(1070)          T2=(-B-SQRTD)/(2*A)
(1071)  C
(1072)  C       *** PICK THE MINIMUM T BETWEEN 0-1 (MUST BE ONE)
(1073)          IF (T1.LT.0.) T1=1.
(1074)          IF (T2.LT.0.) T2=1.
(1075)          RATIO=AMIN1(T1,T2)
(1076)  C
(1077)  C       *** SET LABEL END POINT
(1078)          X2L=X1+RATIO*(X2-X1)
(1079)          Y2L=Y1+RATIO*(Y2-Y1)
(1080)  C
(1081)  C       *** CALCULATE LABEL ANGLE
(1082)          DX=X2L-X1L
(1083)          DY=Y2L-Y1L
(1084)          ANG=0.
(1085)          IF (DY.NE.0.) ANG=ATAN2(DY,DX)
(1086)  C
(1087)          XL=X1L
(1088)          YL=Y1L
(1089)          COSA=COS(ANG)
(1090)          SINA=SIN(ANG)
(1091)  C
(1092)  C       *** REVERSE EVERYTHING IF ANGLE IN QUADRANTS 2 OR 3
(1093)          IF (DX.GE.0.) GO TO 25
(1094)          XL=X2L
(1095)          YL=Y2L
(1096)          COSA=-COSA
(1097)          SINA=-SINA
(1098)          IF (DY.GE.0.) ANG=ANG-3.1415926536
(1099)          IF (DY.LT.0.) ANG=ANG+3.1415926536
(1100)       25 ANGD=ANG*180./3.1415926536
(1101)  C
(1102)  C       *** LOCATE AND PLOT LABEL
(1103)          XL=XL+OFF*COSA+OFF*SINA
(1104)          YL=YL+OFF*SINA-OFF*COSA
(1105)          IDG=NCHR-2
(1106)          CALL NUMBER (XL,YL,CHRSZ,OZL,ANGD,IDG)
(1107)  C
(1108)  C       *** FINISH OFF THIS SEQMENT BY MEANS OF A PSUEDO REENTRY
(1109)          TOTSZ=0.
(1110)          SKPSZ=DIST
(1111)          NSV=0
(1112)          X1=X2L
(1113)          Y1=Y2L
(1114)          CALL PLOT (X1,Y1,3)
(1115)          GO TO 5
(1116)  C
(1117)  C*******************************************************************
(1118)  C                    ENTRY VVLBL1L
```

```
(1119)  C*****************************************************************
(1120)  C
(1121)   3000 CONTINUE
(1122)  C
(1123)  C       *** PLOT THE SAVED VECTORS IF ANY
(1124)          IF (NSV.EQ.0) RETURN
(1125)          DO 30 I=1,NSV
(1126)          CALL PLOT (XSV(I),YSV(I),2)
(1127)       30 CONTINUE
(1128)          NSV=0
(1129)          RETURN
(1130)   C
(1131)          END
```

```
(1132)          SUBROUTINE KURV1 (NPTS,X,Y,NSLOPE,SLOPE1,SLOPEN,XP,YP,TEMP,S,SIGMA
(1133)         1)
(1134)    C
(1135)    C     THIS SUBROUTINE DETERMINES THE PARAMETERS NECESSARY TO
(1136)    C     COMPUTE AN SPLINE UNDER TENSION PASSING THROUGH A SEQUENCE
(1137)    C     OF PAIRS (X(1),Y(1),.....,X(N),Y(N)) IN THE PLANE, THE
(1138)    C     SLOPES AT THE TWO ENDS OF THE CURVE MAY BE SPECIFIED OR
(1139)    C     OMITTED. FOR ACTUAL COMPUTATION OF POINTS ON THE CURVE IT
(1140)    C     IS NECESSARY TO CALL THE SUBROUTINE KURV2.
(1141)    C
(1142)    C     ON INPUT --
(1143)    C     NPTS = THE NUMBER OF POINTS TO BE INTERPOLATED (N.GE.2).
(1144)    C     X = AN ARRAY CONTAINING THE N X-COORDINATES OF THE
(1145)    C         POINTS.
(1146)    C     Y = AN ARRAY CONTAING THE N Y-COODINATES OF THE
(1147)    C         POINTS.
(1148)    C     NSLOPE = A FLAG FOR ENDPOINT SLOPES.  IF ^ 0, THIS IS A CLOSED
(1149)    C         LOOP AND NO SLOPES ARE GIVEN.  IF = 0, THIS IS AN OPEN CURVE
(1150)    C         AND NO SLOPES ARE GIVEN.  IF ) 0, BOTH ENDPOINT SLOPES ARE
(1151)    C         GIVEN
(1152)    C     SLOPE1,SLOPEN = THE DESIRED VALUES FOR THE SLOPE
(1153)    C         OF THE CURVE AT (X(1),Y(1)) AND (X(N),Y(N)), RESPEC-
(1154)    C         TIVELY.  THESE QUANTITIES ARE IN DEGREES AND MEASURED
(1155)    C         COUNTER CLOCKWISE FROM THE POSITIVE X-AXIS.  THE POSITIVE
(1156)    C         SENSE OF THE CURVE IS ASSUMED TO BE THAT MOVING FROM THE
(1157)    C         POINT 1 TO POINT N.
(1158)    C     XP,YP = ARRAYS OF LENGTH AT LEAST N.
(1159)    C     TEMP = AN ARRAY OF LENGTH AT LEAST N WHICH IS USED FOR
(1160)    C         SCRATCH STORAGE.
(1161)    C     SIGMA = THE TENSION FACTOR.  THIS IS NON-ZERO AND
(1162)    C         INDICATES THE CURVINESS DESIRED.  IF SIGMA IS VERY
(1163)    C         LARGE (E.G. 50.) THE RESULTING CURVE IS VERY NEARLY A
(1164)    C         POLYGONAL LINE.  A STANDARD VALUE FOR SIGMA IS 1.
(1165)    C
(1166)    C     ON OUTPUT -
(1167)    C     N,X,Y,SLOPE1,SLOPEN, AND SIGMA ARE UNALTERED.
(1168)    C     XP,YP CONTAIN INFORMATION ABOUT THE CURVATURE OF THE
(1169)    C         CURVE AT THE GIVEN NODE.
(1170)    C     S = THE POLYGONAL ARCLENGTH OF THE CURVE.
(1171)    C
(1172)    C      *** AK CLINE, COMM. ACM 17,4( PR.1974), 221
(1173)    C          MODIFIED BY GW LUNDBERG/SAI  MAY 177
(1174)    C
(1175)          DIMENSION X(NPTS), Y(NPTS), XP(NPTS), YP(NPTS), TEMP(NPTS)
(1176)    C
(1177)          DATA EXPMAX/87.4/
(1178)          TEMAX=-9999.
(1179)          DEGRAD=3.1415926/1 0.
(1180)          N=NPTS
(1181)          SLP1=SLOPE1
(1182)          SLPN=SLOPEN
(1183)          NM1=N-1
(1184)          NP1=N+1
(1185)          DELX1=X(2)-X(1)
(1186)          DELY1=Y(2)-Y(1)
(1187)          DELS1=SQRT(DELX1*DELX1+DELY1*DELY1)
```

```
(1188)          DX1=DELX1/DELS1
(1189)          DY1=DELY1/DELS1
(1190)   C
(1191)   C       *** DETERMINE SLOPES IF NECESSARY
(1192)          IF (NSLOPE) 55,45,5
(1193)        5 SLPP1=SLP1*DEGRAD
(1194)          SLPPN=SLPN*DEGRAD
(1195)   C
(1196)   C       *** SET UP RIGHT HAND SIDES OF TRIDIAGONAL LINEAR SYSTEM FOR
(1197)   C           XP AND YP
(1198)       10 XP(1)=DX1-COS(SLPP1)
(1199)          YP(1)=DY1-SIN(SLPP1)
(1200)          TEMP(1)=DELS1
(1201)          S=DELS1
(1202)          IF (N.EQ.2) GO TO 20
(1203)          DO 15 I=2,NM1
(1204)          DELX2=X(I+1)-X(I)
(1205)          DELY2=Y(I+1)-Y(I)
(1206)          DELS2=SQRT(DELX2*DELX2+DELY2*DELY2)
(1207)          DX2=DELX2/DELS2
(1208)          DY2=DELY2/DELS2
(1209)          XP(I)=DX2-DX1
(1210)          YP(I)=DY2-DY1
(1211)          TEMP(I)=DELS2
(1212)          TEMAX=AMAX1(TEMAX,TEMP(I))
(1213)          DELX1=DELX2
(1214)          DELY1=DELY2
(1215)          DELS1=DELS2
(1216)          DX1=DX2
(1217)          DY1=DY2
(1218)   C
(1219)   C       *** ACCUMULATE POLYGONAL ARCLENGTH
(1220)          S=S+DELS1
(1221)       15 CONTINUE
(1222)       20 XP(N)=COS(SLPPN)-DX1
(1223)          YP(N)=SIN(SLPPN)-DY1
(1224)   C
(1225)   C       *** DENORMALIZE TENSION FACTOR
(1226)          SIGMAP=ABS(SIGMA)*FLOAT(N-1)/S
(1227)          DELT1=SIGMAP*TEMAX
(1228)          IF (DELT1.LT.EXPMAX) GO TO 25
(1229)          SIGMAP=0.9*EXPMAX/TEMAX
(1230)          SGN=1.0
(1231)          IF (SIGMA.LT.0.) SGN=-1.0
(1232)          SIGMA=SIGMAP*SGN*S/FLOAT(N-1)
(1233)       25 CONTINUE
(1234)   C
(1235)   C       *** PERFORM FORWARD ELIMINATION ON TRIDIAGONAL SYSTEM
(1236)          DELS=SIGMAP*TEMP(1)
(1237)          EXPS=EXP(DELS)
(1238)          SINHS=.5*(EXPS-1./EXPS)
(1239)          SINHIN=1./(TEMP(1)*SINHS)
(1240)          DIAG1=SINHIN*(DELS*.5*(EXPS+1./EXPS)-SINHS)
(1241)          DIAGIN=1./DIAG1
(1242)          XP(1)=DIAGIN*XP(1)
(1243)          YP(1)=DIAGIN*YP(1)
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```
(1244)          SPDIAG=SINHIN*(SINHS-DELS)
(1245)          TEMP(1)=DIAGIN*SPDIAG
(1246)          IF (N.EQ.2) GO TO 35
(1247)          DO 30 I=2,NM1
(1248)          DELS=SIGMAP*TEMP(I)
(1249)          EXPS=EXP(DELS)
(1250)          SINHS=.5*(EXPS-1./EXPS)
(1251)          SINHIN=1./(TEMP(I)*SINHS)
(1252)          DIAG2=SINHIN*(DELS*(.5*(EXPS+1./EXPS))-SINHS)
(1253)          DIAGIN=1./(DIAG1+DIAG2-SPDIAG*TEMP(I-1))
(1254)          XP(I)=DIAGIN*(XP(I)-SPDIAG*XP(I-1))
(1255)          YP(I)=DIAGIN*(YP(I)-SPDIAG*YP(I-1))
(1256)          SPDIAG=SINHIN*(SINHS-DELS)
(1257)          TEMP(I)=DIAGIN*SPDIAG
(1258)          DIAG1=DIAG2
(1259)       30 CONTINUE
(1260)       35 DIAGIN=1./(DIAG1-SPDIAG*TEMP(NM1))
(1261)          XP(N)=DIAGIN*(XP(N)-SPDIAG*XP(NM1))
(1262)          YP(N)=DIAGIN*(YP(N)-SPDIAG*YP(NM1))
(1263)    C
(1264)    C     *** PERFORM BACK SUBSTITUTION
(1265)          DO 40 I=2,N
(1266)          IBAK=NP1-I
(1267)          XP(IBAK)=XP(IBAK)-TEMP(IBAK)*XP(IBAK+1)
(1268)          YP(IBAK)=YP(IBAK)-TEMP(IBAK)*XP(IBAK+1)
(1269)       40 CONTINUE
(1270)          RETURN
(1271)       45 IF (N.EQ.2) GO TO 50
(1272)    C
(1273)    C     *** IF NO SLOPES ARE GIVEN, USE SECOND ORDER INTERPOLATION ON
(1274)    C         INPUT DATA FOR SLOPES AT ENDPOINTS
(1275)          DELS2=SQRT((X(3)-X(2))**2+(Y(3)-Y(2))**2)
(1276)          DELS12=DELS1+DELS2
(1277)          C1=-(DELS12+DELS1)/DELS12/DELS1
(1278)          C2=DELS12/DELS1/DELS2
(1279)          C3=-DELS1/DELS12/DELS2
(1280)          SX=C1*X(1)+C2*X(2)+C3*X(3)
(1281)          SY=C1*Y(1)+C2*Y(2)+C3*Y(3)
(1282)          SLPP1=ATAN2(SY,SX)
(1283)          DELNM1=SQRT((X(N-2)-X(NM1))**2+(Y(N-2)-Y(NM1))**2)
(1284)          DELN=SQRT((X(NM1)-X(N))**2+(Y(NM1)-Y(N))**2)
(1285)          DELNN=DELNM1+DELN
(1286)          C1=(DELNN+DELN)/DELNN/DELN
(1287)          C2=-DELNN/DELN/DELNM1
(1288)          C3=DELN/DELNN/DELNM1
(1289)          SX=C3*X(N-2)+C2*X(NM1)+C1*X(N)
(1290)          SY=C3*Y(N-2)+C2*Y(NM1)+C1*Y(N)
(1291)          SLPPN=ATAN2(SY,SX)
(1292)          GO TO 10
(1293)    C
(1294)    C     *** IF ONLY TWO POINTS AND NO SLOPES ARE GIVEN, USE STRAIGHT
(1295)    C         LINE SEGMENT FOR CURVE
(1296)       50 XP(1)=0.
(1297)          XP(2)=0.
(1298)          YP(1)=0.
(1299)          YP(2)=0.
```

```
(1300)          RETURN
(1301)   C
(1302)   C      *** CLOSED LOOP -- PERIODIC SPLINE -- CALCULATE SLOPES
(1303)   C          FOR JOIN
(1304)       55 DELN=SQRT((X(NM1)-X(N))**2+(Y(NM1)-Y(N))**2)
(1305)          DELNN=DELS1+DELN
(1306)          C1=-DELS1/DELN/DELNN
(1307)          C2=(DELS1-DELN)/DELS1/DELN
(1308)          C3=DELN/DELNN/DELS1
(1309)          SX=C1*X(NM1)+C2*X(1)+C3*X(2)
(1310)          SY=C1*Y(NM1)+C2*Y(1)+C3*Y(2)
(1311)          IF (SX.EQ.0..AND.SY.EQ.0.) SX=1
(1312)          SLPP1=ATAN2(SY,SX)
(1313)          SLPPN=SLPP1
(1314)          GO TO 10
(1315)          END
```

```
(1316)            SUBROUTINE KURV2 (T,XS,YS,N,X,Y,XP,YP,S,SIGMA)
(1317)      C
(1318)      C     THIS SUBROUTINE PERFORMS THE MAPPING OF POINTS IN THE
(1319)      C     INTERVAL (0.,1.) ONTO A CURVE IN THE PLANE.  THE SUBROUTINE
(1320)      C     KURV1 SHOULD BE CALLED EARLIER TO DETERMINE CERTAIN
(1321)      C     NECESSARY PARAMETERS.  THE RESULTING CURVE HAS A PARAMETRIC
(1322)      C     REPRESENTATION BOTH OF WHOSE COMPONENTS ARE SPLINES UNDER
(1323)      C     TENSION AND FUNCTIONS OF THE POLYGONAL ARCLENGTH PARAMETER.
(1324)      C
(1325)      C     ON INPUT--
(1326)      C     T = A REAL VALUE OF ABSOLUTE VALUE LESS THAN OR
(1327)      C         EQUAL TO 1.  TO BE MAPPED TO A POINT ON THE CURVE.  THE
(1328)      C         SIGN OF T IS IGNORED AND THE INTERVAL (0.,1.) IS MAPPED
(1329)      C         ONTO THE ENTIRE CURVE.  IF T IS NEGATIVE THIS INDICATES
(1330)      C         THAT THE SUBROUTINE HAS BEEN CALLED PREVIOUSLY (WITH ALL
(1331)      C         OTHER INPUT VARIABLES UNALTERED) AND THAT THIS VALUE OF
(1332)      C         T EXCEEDS THE PREVIOUS VALUE IN ABSOLUTE VALUE.  WITH
(1333)      C         SUCH INFORMATION THE SUBROUTINE IS ABLE TO MAP THE POINT
(1334)      C         MUCH MORE RAPIDLY.  THUS IF THE USER SEEKS TO MAP A
(1335)      C         SEQUENCE OF POINTS ONTO THE SAME CURVE, EFFICIENCY IS
(1336)      C         GAINED BY ORDERING THE VALUES INCREASING IN MAGNITUDE
(1337)      C         AND SETTING THE SIGNS OF ALL BUT THE FIRST, NEGATIVE.
(1338)      C     N = THE NUMBER OF POINTS WHICH WERE INTERPOLATED
(1339)      C         TO DETERMINE THE CURVE.
(1340)      C     X,Y = ARRAYS CONTAINING THE X- AND Y-COORDINATES
(1341)      C         OF THE INTERPOLATED POINTS.
(1342)      C     XP,YP = THE ARRAYS OUTPUT FROM KURV2 CONTAINING
(1343)      C         CURVATURE INFORMATION.
(1344)      C     S = THE POLYGONAL ARCLENGTH OF THE CURVE.
(1345)      C     SIGMA = THE TENSION FACTOR (ITS SIGN IS IGNORED).
(1346)      C
(1347)      C     THE PARAMETERS N,X,Y,XP,YP,S, AND SIGMA SHOULD BE INPUT
(1348)      C     UNALTERED FROM THE OUTPUT OF KURV1.
(1349)      C
(1350)      C     ON  OUTPUT--
(1351)      C     XS,YS = THE X- AND Y-COORDINATES OF THE IMAGE
(1352)      C         POINT ON THE CURVE.
(1353)      C     T,N,X,Y,XP,YP,S, AND SIGMA ARE UNALTERED.
(1354)      C
(1355)            DIMENSION X(N), Y(N), XP(N), YP(N)
(1356)      C
(1357)      C     *** DENORMALIZE SIGMA
(1358)            SIGMAP=ABS(SIGMA)*FLOAT(N-1)/S
(1359)      C
(1360)      C     *** STRETCH UNIT INTERVAL INTO ARCLENGTH DISTANCE
(1361)            TN=ABS(T*S)
(1362)      C
(1363)      C     *** FOR NEGATIVE T START SEARCH WHERE PREVIOUSLY TERMINATED.
(1364)      C         OTHERWISE START FROM BEGINNING
(1365)            IF (T.LT.0.) GO TO 5
(1366)            I1=2
(1367)            XS=X(1)
(1368)            YS=Y(1)
(1369)            SUM=0.
(1370)            IF (T.LE.0.) RETURN
(1371)          5 CONTINUE
```

```
(1372)  C
(1373)  C     *** DETERMINE INTO WHICH SEGMENT TN IS MAPPED
(1374)        DO 15 I=I1,N
(1375)        DELX=X(I)-X(I-1)
(1376)        DELY=Y(I)-Y(I-1)
(1377)        DELS=SQRT(DELX*DELX+DELY*DELY)
(1378)        IF (SUM+DELS-TN) 10,20,20
(1379)     10 SUM=SUM+DELS
(1380)     15 CONTINUE
(1381)  C
(1382)  C     *** IF ABS(T) IS GREATER THAN 1., RETURN TERMINAL POINT ON
(1383)  C         CURVE
(1384)  C
(1385)        XS=X(N)
(1386)        YS=Y(N)
(1387)        RETURN
(1388)  C
(1389)  C     *** SET UP AND PERFORM INTERPOLATION
(1390)     20 DEL1=TN-SUM
(1391)        DEL2=DELS-DEL1
(1392)        EXPS1=EXP(SIGMAP*DEL1)
(1393)        SINHD1=.5*(EXPS1-1./EXPS1)
(1394)        EXPS=EXP(SIGMAP*DEL2)
(1395)        SINHD2=.5*(EXPS-1./EXPS)
(1396)        EXPS=EXPS1*EXPS
(1397)        SINHS=.5*(EXPS-1./EXPS)
(1398)        XS=(XP(I)*SINHD1+XP(I-1)*SINHD2)/SINHS+((X(I)-XP(I))*DEL1+(X(I-1)-
(1399)       1XP(I-1))*DEL2)/DELS
(1400)        YS=(YP(I)*SINHD1+YP(I-1)*SINHD2)/SINHS+((Y(I)-YP(I))*DEL1+(Y(I-1)-
(1401)       1YP(I-1))*DEL2)/DELS
(1402)        I1=I
(1403)        RETURN
(1404)        END
```

```
      SUBROUTINE ISOPLT (X,Y,IENTRY)
C
C --- CREATE LINE PRINTER PLOTS OF PLUVUE RESULTS
C
C
C --- DEFINE COMMON BLOCKS
C
      COMMON /ITIT1/ ITIT(80),KALCMP,IOBS
      COMMON /NEED1/ SCTANG(8),IL,ISTAB,WIND,WDIR
      COMMON /POOL/ XISIZ,YSIZ,CYCSIZ,XD(18),INDXX,IC1
      COMMON /SIZE/ JGRID(97,40),TVERT(52,2),PT(20,4)
      COMMON /CPLT/ FRST(4),FIN(4),SCAL1(4),TSTP(4),ASTP(4),
     1              NDEC(4),ITITLE(5,4),NT(4),XMAX
      COMMON /LBL2/ LBEL(3,8)
      DIMENSION TPRINT(13),JSYMB(8),TV1(10),XTIT(6,2)
      DIMENSION STAB(2,2)
C
C --- INITIALIZE LOCAL VARIABLES HERE
C
      DATA JBLANK/1H     /,MAXX/97/,MAXY/40/,MAXPNT/80/,TGRID/96./,
     1     CGRID/39./,JPLUS/1H+/,JBAR/1H1/,TBLANK/1H  /
      DATA JSYMB/1H+,1H*,1HX,1HO,1H.,1HA,1HB,1HC/
      DATA STAB/4HNEUT,4HRAL ,4HSTAB,4HLE   /
      DATA XTIT/4HAZIM,4HUTH ,4HANGL,4HE (D,4HEGRE ,4HES) ,
     1          4HDOWN,4HWIND,4H DIS,4HTANC,4HE (K,4HM)   /
C
C --- FLAG FOR ENTRY POINT
C
      GO TO (1,50,65), IENTRY
C
C --- INITIALIZE GRID AND SET UP AXIS LABELS
C
    1 IX=IFIX(Y+0.1)
      IF (IOBS.GT.0) IX=2
      DO 5 J=1,MAXY
      JGRID(1,J)=JBAR
      JGRID(97,J)=JBAR
    5 CONTINUE
      INOW=IFIX(X+0.1)
      IF (INOW.EQ.1) I1=16
      IF (INOW.EQ.1) I2=24
      IF (INOW.EQ.2.OR.INOW.EQ.3) I1=12
      IF (INOW.EQ.2.OR.INOW.EQ.3) I2=27
      IF (INOW.EQ.4) I1=9
      IF (INOW.EQ.4) I2=30
      DO 10 I=1,52
      TVERT(I,1)=TBLANK
      IF (I.LE.I1.OR.I.GE.I2) GO TO 10
      K=I-I1
      TVERT(I,1)=PT(K,INOW)
   10 CONTINUE
      DO 20 J=1,40,4
      JGRID(1,J)=JPLUS
      JGRID(97,J)=JPLUS
   20 CONTINUE
      INW=5-INOW
```

```
(1461)          CLOW=FRST(INW)
(1462)          TLOW=0.
(1463)          CHIGH=FIN(INW)
(1464)          CSPAN=CGRID/(CHIGH-CLOW)
(1465)          THIGH=XMAX
(1466)          DO 30 I=1,10
(1467)          M=11-I
(1468)          TV1(I)=(FLOAT(M)/10.)*(CHIGH-CLOW)+CLOW
(1469)       30 CONTINUE
(1470)          TSPAN=TGRID/THIGH
(1471)          DO 35 J=1,13
(1472)          TPRINT(J)=(FLOAT(J-1)/12.)*THIGH
(1473)       35 CONTINUE
(1474)    C
(1475)    C --- CLEAR GRID
(1476)    C
(1477)          MAXX1=MAXX-1
(1478)          MAXY1=MAXY-1
(1479)          DO 40 K=1,MAXY
(1480)          DO 40 J=2,MAXX1
(1481)          JGRID(J,K)=JBLANK
(1482)       40 CONTINUE
(1483)          RETURN
(1484)    C
(1485)    C --- ENTRY FOR SAVING INTERPOLATED POINTS
(1486)    C
(1487)       50 CONTINUE
(1488)          KX=IFIX((X-TLOW)*TSPAN+1.5)
(1489)          IF (IOBS.GT.0) KX=IFIX(((10.**X)-TLOW)*TSPAN+1.5)
(1490)          KY=IFIX((Y-CLOW)*CSPAN-0.5)
(1491)          KY=MAXY-KY
(1492)          IF (KY.LT.2) GO TO 60
(1493)          IF (KY.GT.MAXY1) GO TO 60
(1494)          IF (KX.LT.2) GO TO 60
(1495)          IF (KX.GT.MAXX1) GO TO 60
(1496)          JGRID(KX,KY)=JSYMB(IL)
(1497)       60 RETURN
(1498)    C
(1499)    C --- ENTRY FOR PLOTTING GRID
(1500)    C
(1501)       65 CONTINUE
(1502)          WRITE (6,120) TVERT(1,1),TV1(1)
(1503)          DO 115 K=2,MAXY
(1504)          L=MOD((K-1),4)
(1505)          I=(K-1)/4+1
(1506)          IF (L.EQ.0) WRITE (6,130) TVERT(K,1),TV1(I),(JGRID(J,K),J=1,MAXX)
(1507)          IF (L.NE.0) WRITE (6,135) TVERT(K,1),(JGRID(J,K),J=1,MAXX)
(1508)      115 CONTINUE
(1509)          WRITE (6,140) CLOW
(1510)          WRITE (6,155) TPRINT, (XTIT(I,IX),I=1,6)
(1511)          WRITE (6,150) ITIT
(1512)          WRITE (6,145) ISTAB,WIND,WDIR
(1513)          IF (IOBS.LE.0)
(1514)         1WRITE (6,160) (SCTANG(J),(LBEL(I,J),I=1,3),J=1,IC1)
(1515)          IF (IOBS.GT.0) WRITE (6,165) (SCTANG(J),(LBEL(I,J),I=1,3),J=1,IC1)
(1516)    99999 RETURN
```

```
(1517)  C
(1518)  C --- FORMAT STATEMENTS
(1519)  C
(1520)     120 FORMAT (1H1,////////,9X,A4,F5.2,1H+,12(8H-------+))
(1521)     130 FORMAT (9X,A4,F5.2,97A1)
(1522)     135 FORMAT (9X,A4,5X,97A1)
(1523)     140 FORMAT (13X,F5.2,1H+,12(8H-------+))
(1524)     145 FORMAT (1H0,/,10X,16HSTABILITY CLASS ,A4,F8.1,
(1525)        1          16H M/S WIND SPEED  ,F10.1,
(1526)        2          23H DEGREE WIND DIRECTION  )
(1527)     150 FORMAT (26X,80A1)
(1528)     155 FORMAT (F21.1,12(F7.1,1X),/,1H0,55X,6A4,//)
(1529)     160 FORMAT (1H0,/,10X,29HASSUMED VIEWING BACKGROUND - ,
(1530)        1          F5.0,4H=(+),1X,3A4,F5.0,4H=(*),1X,3A4,1X,
(1531)        2          F5.0,4H=(X),1X,3A4,F5.0,4H=(O),1X,3A4,
(1532)        3          F5.0,4H=(.),1X,3A4,F5.0,4H=(A),1X,3A4,
(1533)        4          F5.0,4H=(B),1X,3A4,F5.0,4H=(C),1X,3A4 )
(1534)     165 FORMAT(1H0,/,10X,19HWIND SPEED CASES - ,
(1535)        1          F5.0,4H=(+),1X,3A4,F5.0,4H=(*),1X,3A4,1X,
(1536)        2          F5.0,4H=(X),1X,3A4,F5.0,4H=(O),1X,3A4,
(1537)        3          F5.0,4H=(.),1X,3A4,F5.0,4H=(A),1X,3A4,
(1538)        4          F5.0,4H=(B),1X,3A4,F5.0,4H=(C),1X,3A4 )
(1539)           END
```

GLOSSARY

ABSNO2: The value b_{abs}, the absorption coefficient, for the background atmosphere NO_2 concentration at 0.55 μm.

ACCUMULATION MODE: Aerosol in the size range from 0.1 to 1.0 μm

ALPHA: The azimuthal angle (in the horizontal plane) between the plume centerline and the line of sight.

AZIMUTH: The azimuthal angle measured clockwise from north to the line of sight.

BETA: The elevation angle of the line of sight above the horizon.

BSCAT.55/MASS: The value of b_{scat}/per unit mass concentration for a particular aerosol size distribution (at 0.55 μm).

BRATIO: The blue-red ratio used to characterize the wavelength-dependent contrast and plume coloration with respect to the background. This ratio is calculated using the ratio of plume to background intensities at the blue end (λ = 0.4 μm) and at the red end (λ = 0.7 μm) of the visible spectrum. If I_p represents the intensity for the view of the background through the plume, and if I_b represents the intensity for the view of the background without the plume, then the blue-red ratio is defined thus:

$$\text{BRATIO} = \frac{I_p(0.4\ \mu m)/I_h(0.4\ \mu m)}{I_p(0.7\ \mu m)/I_h(0.7\ \mu m)}$$

BSP-TOTAL: The value of b_{scat} for plume primary aerosol and sulfate aerosol at 0.55 μm.

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BSPSN/BS (%): The ratio between the b_{scat} for sulfate aerosol and the b_{scat} for plume primary aerosol and sulfate aerosol.

BTAAER: The value of b_{scat} for the background atmosphere aerosol at 0.55 μm.

BTABAC: The value of b_{ext}, the extinction coefficient for the background atmosphere, at 0.55 μm. BTABAC is the sum of BTARAY, BTAAER, and ABSNO2.

BTARAY: The value of b_{scat} for the Rayleigh atmosphere at 0.55 μm.

COARSE PARTICLE MODE: Aerosol from 1.0 to 10.0 μm.

C(550): The contrast at 550 nm between the light intensity from the plume and the intensity of the background. The contrast is calculated by the following equation:

$$C(550) = \frac{I_p\ (\lambda = 0.55\ \mu m) - I_b(\lambda = 0.55\ \mu m)}{I_b\ (\lambda = 0.55\ \mu m)}$$

where I_p = light intensity transmitted from the plume, and I_b = light intensity transmitted from the background.

DELL: The difference in the color brightness parameter L* for the view of the background without the plume and the view of the background with the plume.

DELTA H (M): The rise of the plume parcel above the elevation of the point of release, measured in meters.

DELX: The difference in the chromaticity coordinate x for the view of the background with and without the plume.

DELY: The difference in the chromaticity coordinate y for the view of the background with and without the plume.

DELYCAP: The difference in the luminance Y for the view of the background with and without the plume.

DOWNWIND DISTANCE: Distance from the emissions source to points along the plume trajectory.

E(LAB): The color difference parameter ΔE (L*a*b*) for the view through the plume compared to the background sky. ΔE (L*a*b*) includes changes in chromaticity and brightness.

E(LUV): The color difference parameter $\Delta E(L^*u^*v^*)$, which includes changes in chromaticity and brightness. $E(L^*u^*v^*)$ gives the value of ΔE $(L^*u^*v^*)$ for the view through the plume compared to the background sky.

H: The final height of plume rise.

INCREMENT: The increase in any parameter above the background value.

L: The color brightness parameter L^*.

LENGTH: The length of the plume segment in the line of sight along the plume. The plume centerline concentration is integrated over this distance before the optical effects are calculated.

MASS RADIUS: The mass median radius.

NO2T: The total concentration of NO_2 in a plume parcel; the sum of the NO_2 contributed by the plume and the NO_2 contributed by the background air.

NO2-NO EQUIL: The equilibrium ratio of the concentration of NO_2 to the concentration of NO.

NO2/NTOT (MOLE %): The ratio between the concentration of NO_2 and the concentration of all NO_x.

NO3-/NTOT (MOLE %): The ratio between the concentration of HNO_3 and the concentration of all NO_x.

NTOT: The concentration total of all nitrogen oxides (including HNO_3) in the plume parcel.

O2 (MOL P): The oxygen concentration in the plume expressed in mole percent.

% REDUCED: The percentage reduction in visual range for the view of the background with the plume compared to that without the plume.

PRIMARY PARTICLE MODE: The aerosol emitted directly by the source.

PRIMARY (UG/M^3): The concentration of primary particulate in units of $\mu g/m^3$.

RATIO ACTUAL: The actual ratio of concentrations of NO_2 to NO.

RP: Distance from the observer position to the plume center along the line of sight.

RO/RVO: The ratio between the distance from the observer to the background object and the background visual range.

RP/RVO: The ratio between the distance from the observer to the plume centerline along the line of sight and the background visual range.

RV: The visual range for the line of sight through the plume.

SY: The length representing the vertical standard deviation for a Gaussian plume concentration distribution.

SIGMA: The geometric standard deviation of the aerosol size distribution. Also, the plume standard deviation for the initial plume rise calculation.

SOLAR AZIMUTH ANGLE: The azimuthal angle from the north to the position of the sun, measured clockwise.

SOLAR ZENITH ANGLE: The vertical angle from directly overhead to the position of the sun.

$SO_4^=$/STOT (MOLE %): The ratio between the concentration of $SO_4^=$ and the sum of the concentrations of SO_2, and $SO_4^=$.

THETA: The scattering angle between the incoming direct solar rays and the line of sight. The sun would be in front of the observer for scattering angles less than 90°. THETA is the change in the direction of propagation of light after scattering.

TOTAL AMB: The total of the background contribution and the plume contribution for any parameter.

U: Horizontal velocity component for the plume parcel.

V: Resultant velocity of the plume parcel.

W: Vertical velocity component for the plume parcel.

X: Distance downwind between the observed point and the emissions source; also used for chromaticity coordinate x.

Y: Chromaticity coordinate y.

YCAP: The color brightness parameter, luminance (Y).

REFERENCES

Altshuller, A. P. (1979), "Model Predictions of the Rates of Homogeneous Oxidation of Sulfur Dioxide to Sulfate in the Troposphere," Atmos. Environ., Vol. 13, pp. 1653-1661.

Baulch, D. L., D. D. Drysdale, and D. G. Horne (1973), "Evaluated Kinetic Data for High Temperature Reactions, Volume 2--Homogeneous Gas Phase Reactions of the H_2-N_2-O_2 System (CRC Press, Cleveland, Ohio).

Briggs, G. A. (1972), "Discussion on Chimney Plumes in Neutral and Stable Surroundings," Atmos. Environ., Vol. 6, pp. 507-610.

Briggs, G. A., (1969), "Plume Rise," U.S. Atomic Energy Commission Critical Review Series, TID-25075, National Technical Information Service, Springfield, Virginia.

Briggs, G. A., (1971), "Some Recent Analyses of Plume Rise Observations," in Proc. of the Second International Clean Air Congress, H. M. Englund and W. T. Berry, eds., (Academic Press, New York, New York), pp. 1029-1032.

Calvert, J. G., et al. (1978), "Mechanism of the Homogeneous Oxidation of Sulfur Dioxide in the Troposphere," Atmos. Environ., Vol. 12, pp. 197-226.

Dave, J. V. (1970), "Subroutines for Computing the Parameters of the Electromagnetic Radiation Scattered by a Sphere," IBM System 360 Program 3600-17.4.002.

Davis, D. D., G. Smith, and J. Klauber (1974), "Trace Gas Analysis of Power Plant Plumes Via Aircraft Measurements: O_3, NO_x and SO_2 Chemistry," Science, Vol. 186, pp. 733-736.

Dixon, J. K. (1940), "Absorption Coefficient of Nitrogen Dioxide in the Visible Spectrum,: J. Chem. Phys., Vol. 8, pp. 1267-1277.

Ensor, D. S., L. E. Sparks, and M. J. Pilat (1973), "Light Transmittance Across Smoke Plumes Downwind from Point Sources of Aerosol Emissions," Atmos. Environ., Vol. 7, pp. 1267-1277.

EPA (1977), "User's Manual for a Single-Source (CRSTER) Model," EPA-450/2-77-013, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

Hampson, R. F., Jr., and D. Garvin (1978), "Reaction Rate and Photochemical Data for Atmospheric Chemistry-1977," NBS Special Publication 513, National Bureau of Standards, Washington, D.C.

Hanson, J. E., and L. D. Travis (1974), "Light Scattering in Planetary Atmospherics," Space Science Reviews, Vol. 16, pp. 527-610.

Irvine, W. M. (1975), "Multiple Scattering in Planetary Atmospheres," Icarus, Vol. 25, pp. 175-204.

Isaksen, I.S.A., Hesstredt, and O. Hov (1978), "A Chemical Model for Urban Plumes: Test for Ozone and Particulate Sulfur Formation in St. Louis Urban Plume," Atmos. Environ., Vol. 12, pp. 599-604.

Latimer, D. A. (1980), "Power Plant Impacts on Visibility in the West: Siting and Emissions Control Implications," J. Air Pollut. Control Assoc., Vol. 30, pp. 142-146.

Latimer, D. A., et al. (1980), "Modeling Visibility," presented at the American Meteorological Society/Air Pollution Control Association Second Joint Conference on Applications of Air Pollution Meteorology, 24-27 March 1980, New Orleans, Louisiana.

Latimer, D. A., and G. S. Samuelsen (1978), "Visual Impact of Plumes from Power Plants," Atmos. Environ., Vol. 12, pp. 1455-1465.

Latimer, D. A., et al. (1978), "The Development of Mathematical Models for the Prediction and Anthropogenic Visibility Impairment," EPA-450/3-78-110a, b, and c, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

Latimer, D. A., and G. S. Samuelsen (1975), "Visual Impact of Plumes from Power Plants," UCI-ARTR-75-3, UCI Air Quality Laboratory, School of Engineering, University of California, Irvine, California.

Leighton, P. A. (1961), Photochemistry of Air Pollution (Academic Press, New York, New York).

Miller, D. F. (1978), "Precursor Effects on SO_2 Oxidation," Atmos. Environ., Vol. 12, pp. 273-280.

Niki, H. (1974), "Reaction Kinetics Involving O and N Compounds," Can. J. Chem., Vol. 52, pp. 1397-1404.

Schere, K. L., and K. L. Demerjian (1977), "Calculation of Selected Photolytic Rate Constants over a Diurnal Range," EPA-600/4-77-015, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

Van de Hulst, H. C. (1957), Light Scattering by Small Particles (John Wiley and Sons, New York, New York).

White, W. H. (1977), "NO_x-O_3 Photochemistry in Power Plant Plumes: Comparison of Theory with Observation," Environ. Sci. Technol., Vol. 11, No. 10, pp. 995-1000.

Winkler, P. (1973), "The Growth of Atmospheric Aerosol Particles as a Function of the Relative Humidity--II. An Improved Concept of Mixed Nuclei," Aerosol Sci., Vol. 4, pp. 373-387.